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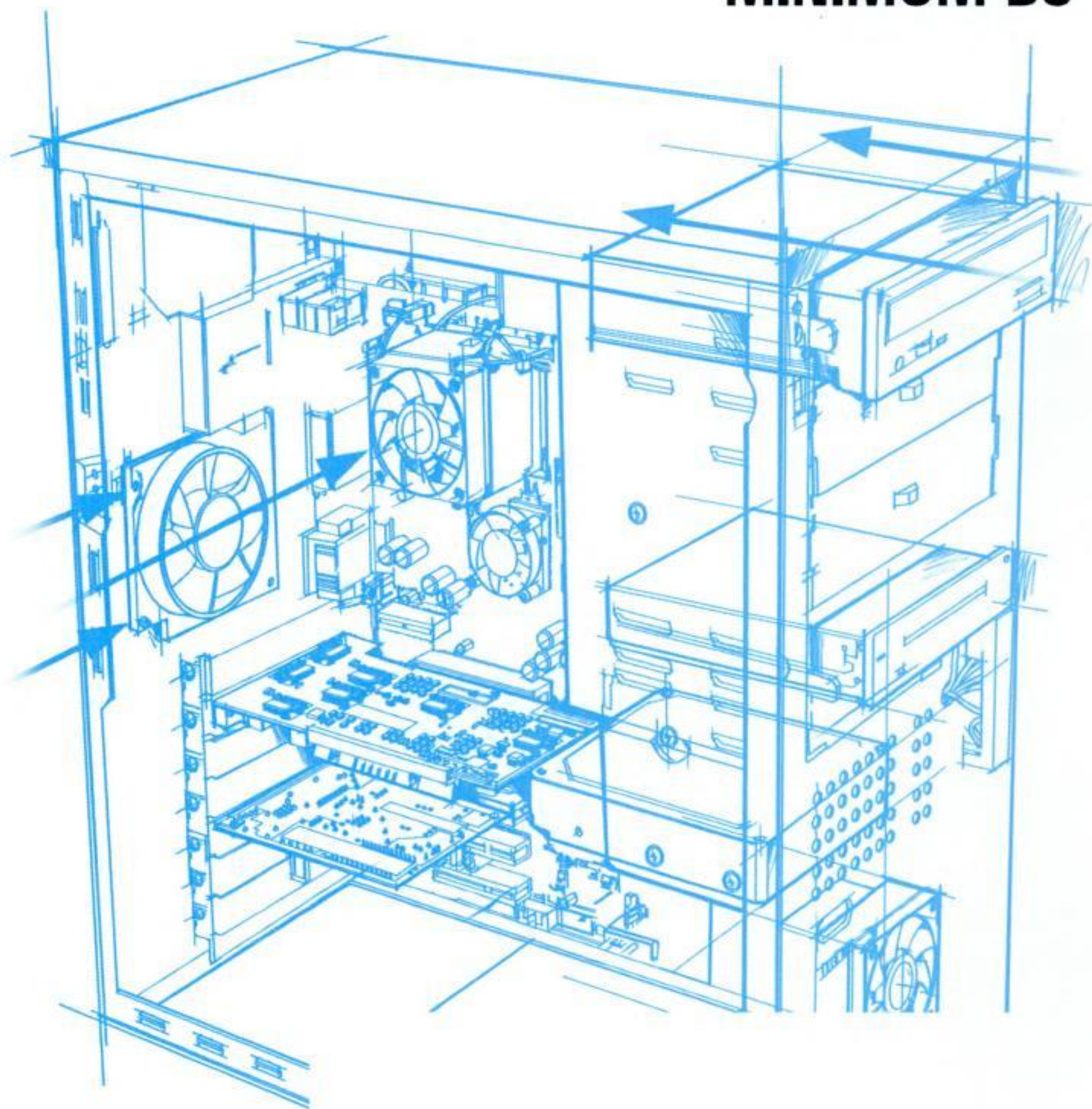
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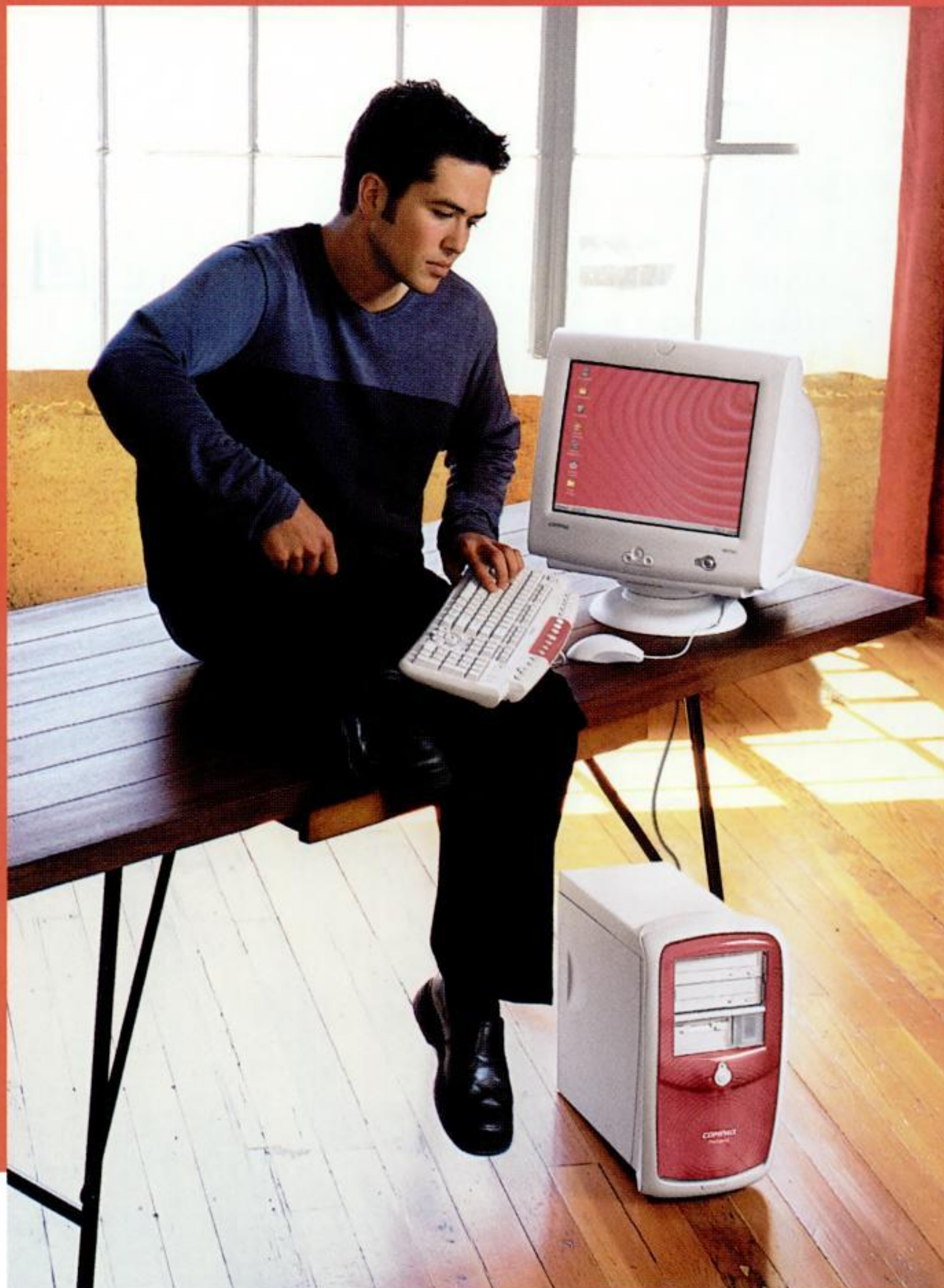
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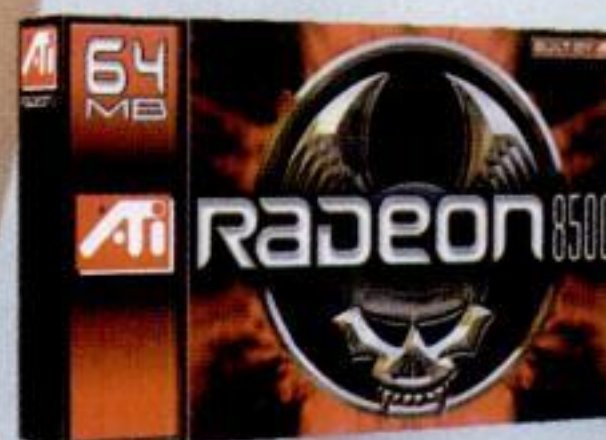


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MAXIMUM PC
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Release Notes



Good Old American Muscle

Twenty-one years later, I can still remember the muscle cars driven by the seniors at my high school. I was a 14-year-old freshman, and depended on the upperclassmen for transport to and from fast food joints, keg parties, or wherever else we might be getting into trouble. One day Jimmy Hunt* pulled over to the curb as I was walking to school and offered me a ride in his Mustang Mach I. Billy Hunt was sitting shotgun, so I had to jump in the back seat—or at least the area that would have been the back seat if Jimmy hadn't ripped out the interior to lighten the car's load.

That Mach I was in a perpetual state of assembly/disassembly. I never saw it without a gray primer finish, and I can't remember a conversation in which Jimmy wasn't talking about doing something dramatic and ill-advised to his engine. Inspiring? You betcha! And that's saying a lot, because I was a Chevy guy at the time. But that ride to school in the Mach I turned me on to the thrill of good old American muscle. Yep, it was a helluva lot of fun riding with Jimmy as he tried to top 85mph from light to light.

It's now 2002, and I can't help but compare the muscle car madness I experienced in the early 1980s with the do-it-yourself PC building mania that I witness every day working on this magazine. In fact, I continually find myself drawing comparisons between the two passions.

Removing the back seat to decrease a car's weight for faster quarter-mile times? That's sort of like removing all the bloat from your System Tray to increase memory resources and speed up boot times.

Stroking and boring your engine to increase its displacement? Jacking up its rev limiter for faster engine speed? Sounds like overclocking a CPU, doesn't it? And the risks are the same too: You have to pay extra special attention to lubrication and cooling to keep the modified parts running smoothly and reliably.

And of course both muscle car fanatics and PC enthusiasts like doing cosmetic modifications to personalize their pride-and-joys. If you're interested in tricking out your own PC—be it for performance, stability, or looks—the best place to start is page 24. Here we provide a complete how-to on building a PC from scratch. Working on computers is a lot cheaper than working on cars, and benchmarking an overclocked CPU with *SYSMark2001* is a helluva lot safer than benchmarking a souped-up engine by racing through a 35mph zone at 85mph.

— JON PHILLIPS

* Names have been changed to protect the foolhardy.

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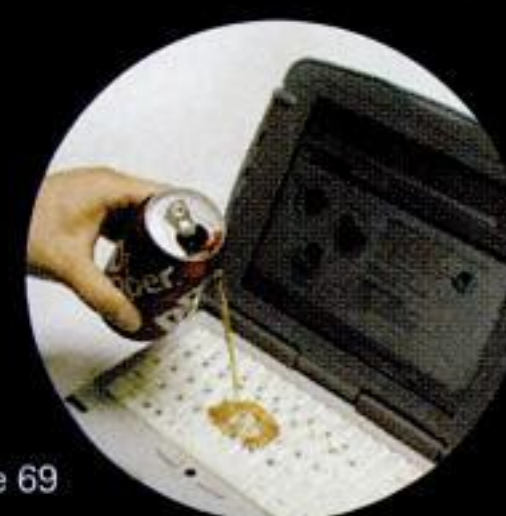
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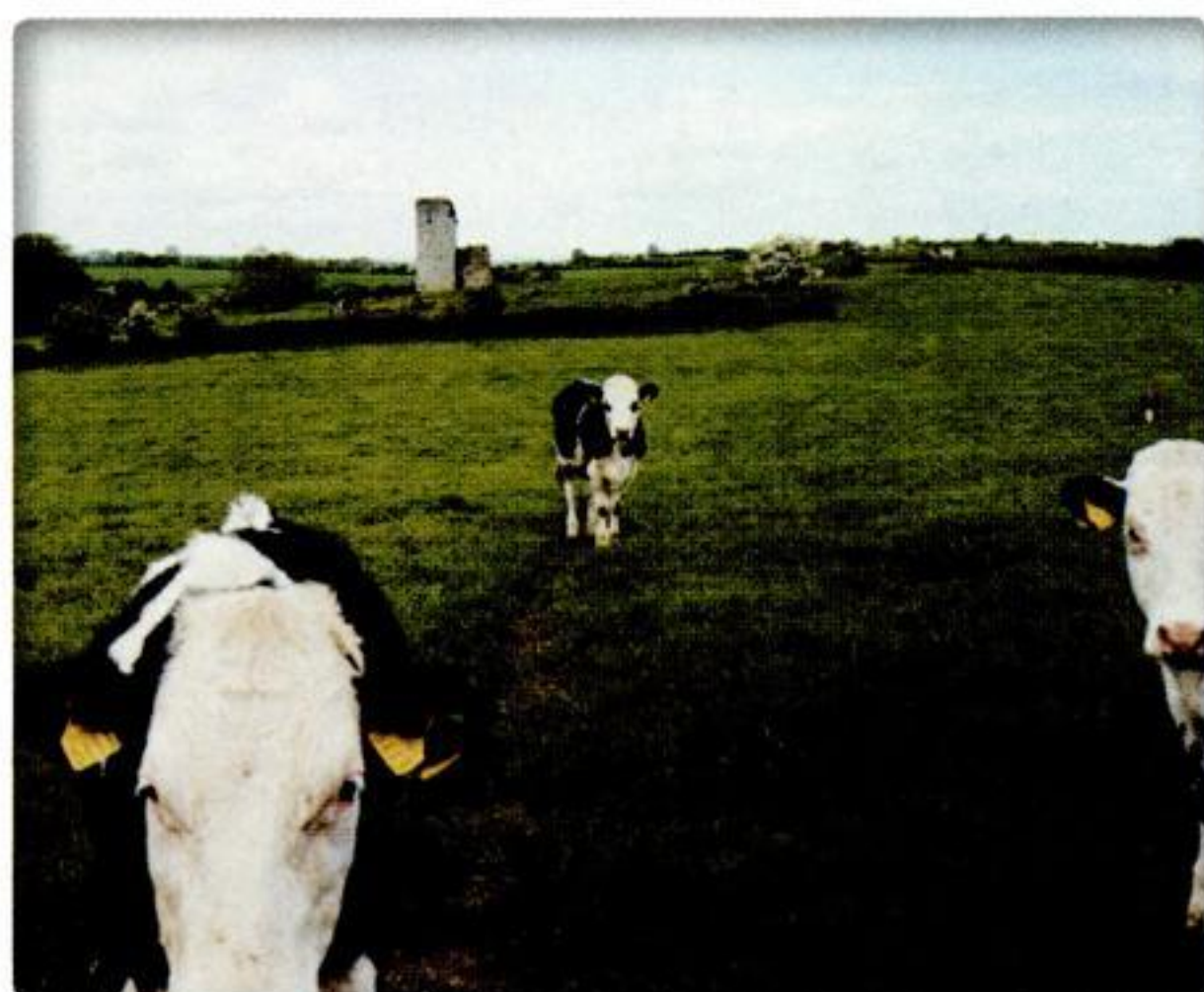
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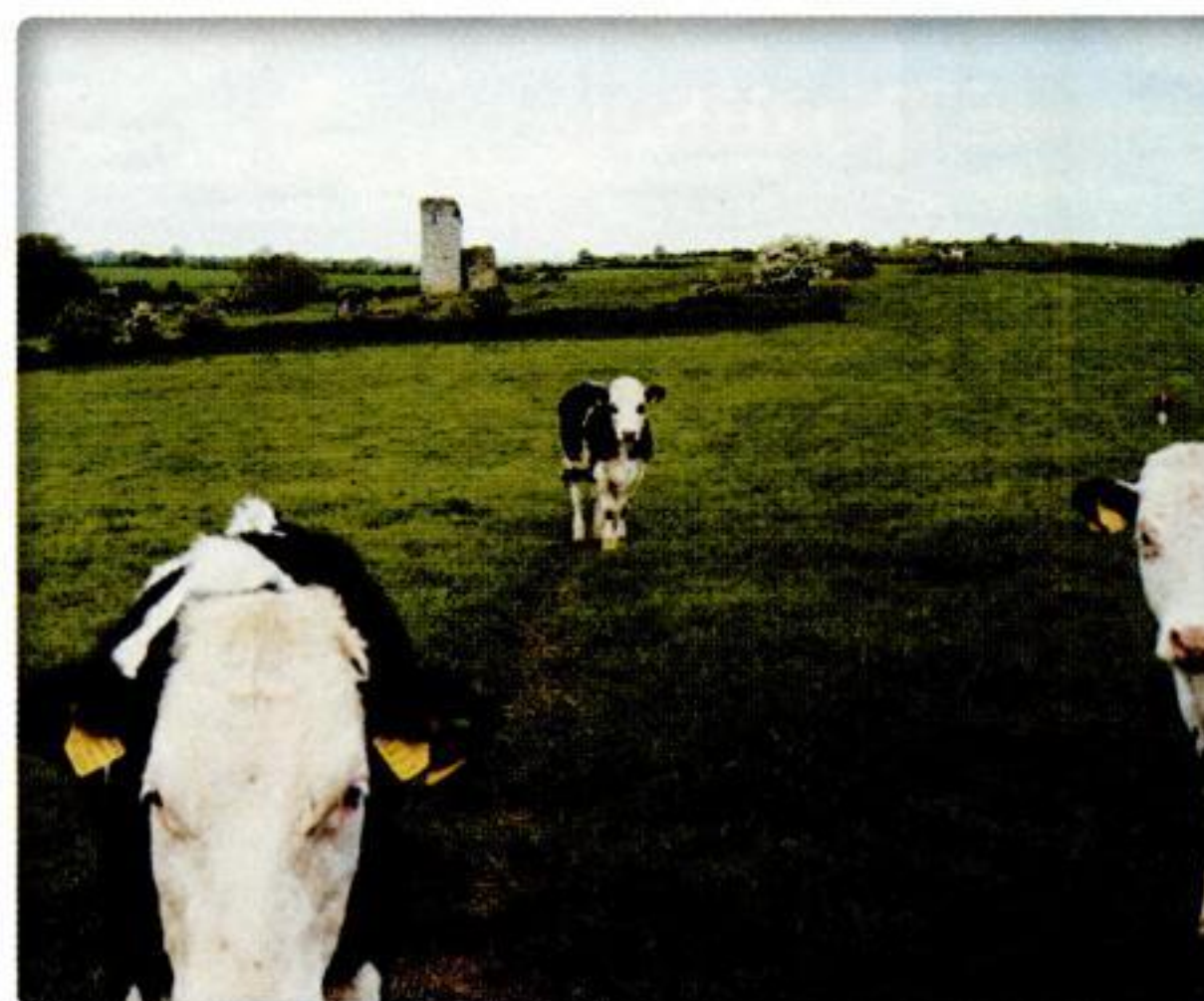
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MARCH 2002

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Tom Halfhill, T. Liam McDonald
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Jim Norris

Andrew Sanchez EDITOR EMERITUS

ART

Natalie Jeday ART DIRECTOR
Monique Martinez ASSOCIATE ART DIRECTOR
Mark Madeo PHOTO EDITOR

CONTRIBUTING PHOTOGRAPHERS
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PRODUCTION

Richard Lesovoy PRODUCTION DIRECTOR
Lawrence Briseno PRODUCTION COORDINATOR

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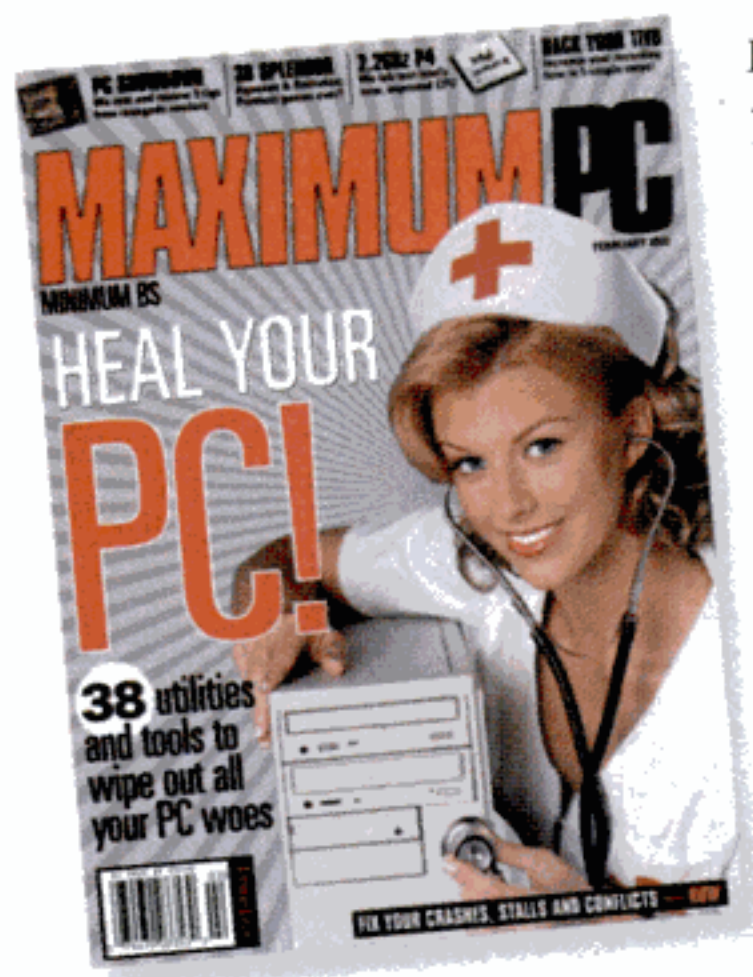
So you think you're ready to build your own rig? Well, you've come to the right place. We give you step-by-step instructions for assembling a PC from scratch, as well as primers on choosing your CPU, motherboard, power supply, and cooling solutions.



46 SCSI

SCSI, once the darling of the power user community, is fast falling out of favor. Find out here what makes the technology unique and why its days are numbered.

AT LEAST WE NEVER CALLED HER A 'CHICK'



I am so frustrated with your magazine. I would rather cancel my subscription than put up with you guys pasting a chick on the cover! Does your magazine need to have a chick on the front of it to sell? Would you like your 5-year-old son to see this kind of stuff on a computer magazine? Isn't there enough sexually directed material and soft porn on the

Internet already?

—AARON HESS

EDITOR-IN-CHIEF JON PHILLIPS

REPLIES: The February 2002 cover image generated a lot of e-mail-to-the-

editor, but about 80 percent of the letters were positive. The remaining letters accused us of exploitation and more or less ram-rodding society down the cultural abyss. One of the best-written letters came from a group of nurses accusing us of "portraying nurses as hypersexual bimbos." But we think Mr. Hess's letter best cuts to the heart of matter, so I'll answer him directly here:

No, we don't feel our magazine will necessarily sell better if it pictures a woman on the cover, and we have no intention of making female cover models a regular feature. But sometimes we land on a cover concept that requires the use of a human subject. We're then faced with a question: Should the subject be a man or a woman? We typically opt for a woman because our readers are overwhelmingly male, and we suspect they'd be more drawn to the face

of an attractive woman than the face of an attractive man. I should also note that general "cover theory" dictates that both men and women are more drawn to cover images of women. Maybe that's why *Maxim* and *Cosmopolitan*—mirror images of each other in the "lifestyle improvement" market—both use female cover models.

If I had a 5-year-old child, I sincerely doubt I'd mind him or her seeing the February cover. The entire *Maximum PC* staff—three women and four men—have discussed the February cover at length, and we all agree that the cover model is far from sexualized. Yes, she's pretty. And, yes, she's wearing makeup. But she's not dressed in a provocative manner (at least as far as the cover goes), and she's not projecting a come-hither expression. To us, she's about as "sexualized" as Heidi or the Swiss Miss girl. But that's just us—and we're from California.

BUT WHO IS SHE?

I just received the February issue and want to know who the girl is on the cover, and how I can get her to autograph my copy?

—THOMAS DILEO

MANAGING EDITOR KATHERINE

STEVENSON REPLIES: Thomas wasn't alone in his interest in our cover model. In fact, we received quite a few e-mails from readers wanting to know who she is and whether

"I have one minor issue with the manner in which you review your systems."

she works with us. Frankly, the whole situation makes us worry. But, since you asked...

Rachel G. is a professional model from Boom! Models and Talent of San Francisco. Her face has graced many magazines, catalogs, and print ads nationwide. She works locally in the Bay Area as well as overseas in Tokyo, Japan. In addition to her modeling career, she is a part-time student and veterinarian assistant. Signing photos isn't in Rachel's contract, but you can see additional photos of her at BoomAgency.com. Rachel's makeup was done by Sherrie L. at Boom!

MISSING THE MARK

I really enjoy reading your magazine for the latest PC news and product reviews. I find it informative and insightful. I do, however, have one minor issue with the manner in which you review your systems. I notice in the benchmarks section that one of the apps you use to test your systems is 3DMark2001. Well, what I find odd is that you record the frames per second from only one game test instead of the actual 3DMark score. I bring this up because I'm a loyal Mad Onion-user and live by the mark. I find it easier to determine a system's overall performance if I see the actual number of 3DMarks instead of just a ballpark FPS number. Wouldn't it just make more sense to use the score the program was intended to output?

—ALEX ELMORE

TECHNICAL EDITOR WILL SMITH REPLIES: At *Maximum PC* we've always used real-world benchmarks, not synthetic benches, from which it's difficult to divine the performance of individual components. Sure, the 3DMark2001 overall score is a relative-

ly good indicator of overall system performance, but it doesn't necessarily hone in on a system's videocard or processor. We use the 3DMark2001 Game 4 demo to tell us how well a system's 3D accelerator handles DirectX 8 games that use programmable shaders. Rather than give you a single synthetic number that's hard to interpret, we'd rather give you several numbers that paint an overall picture of a system and denote the performance of individual subsystems. It must also be noted that we'll soon be reevaluating our benchmarks, and we'll likely come up with new 3D gaming benchmarks in the next few months.

LET'S HEAR IT FOR THE LITTLE GUYS

I know you're all standing around holding your noses when the subject of SiS chipsets and ECS mobos comes up. However, I was surprised to see that you didn't even mention these companies in your story about AMD-compatible chipsets ["Speed Trials," January 02]. Despite lots of bugs, the ECS K7S5A with the SiS 735 chipset has generated tremendous sales and lots of curiosity among enthusiasts.

You also failed to mention that the new K7S6A will have DDR333

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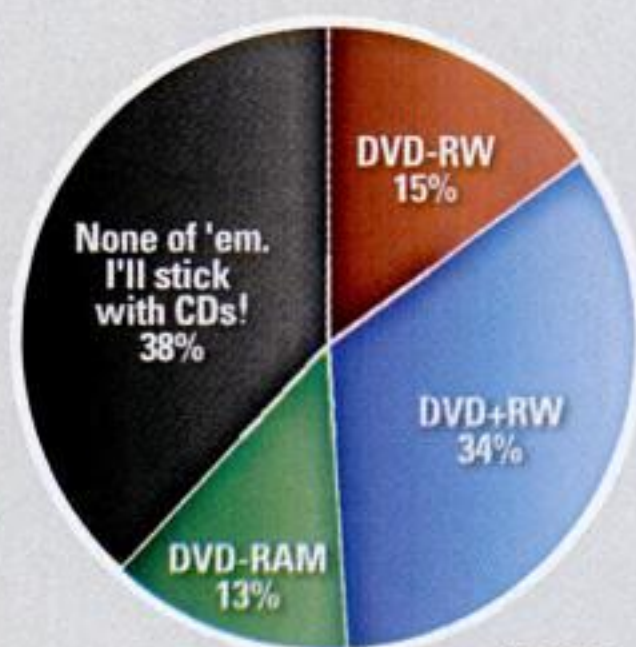
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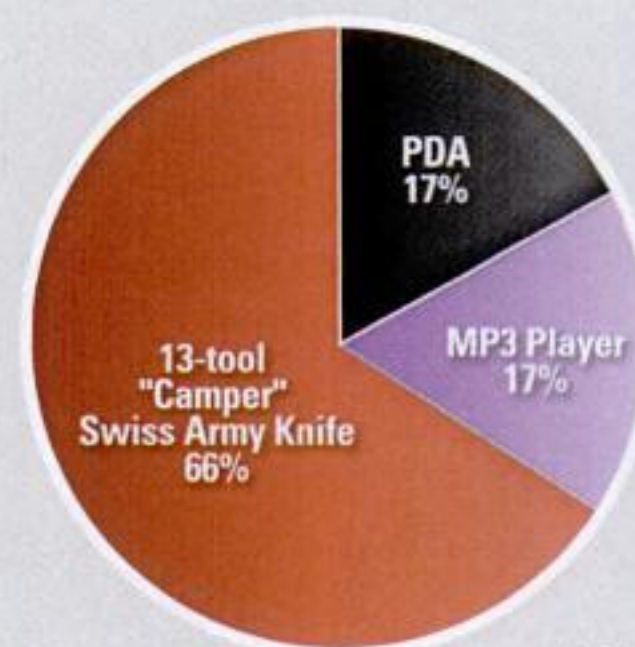
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you intend to buy into?*



(2,206 votes)

*Our readers obviously still favor cheap and plentiful
CDs over expensive DVD recording media. It'll prob-
ably be a while before consumers can pick up spin-
dles of 100 DVD+RW discs at Costco.*

*Which would you most want on a
desert island?*



(1,933 votes)

*Well, at least this proves our readers aren't com-
pletely out of their minds. Consumer electronics are
nice luxury items, but you can't file down the edges
of a conch shell with a PDA, or kill a wild boar with
an MP3 player. Unless you're playing Mariah Carey.*

support and is probably shipping as we speak. The SiS offerings have run nose to nose with, or bettered, all the chipsets you mentioned except perhaps the KT266A. What you also fail to acknowledge is that ECS does it at bargain-basement prices. And lots of people actually like bugs (it's really ho-hum when everything comes together the first time). You people are constantly talking about someone pimping this or that, but are you just pimping your advertisers' products over something new that has really had an impact?

—TODD CHEEK

SENIOR EDITOR GORDON MAH UNG RESPONDS: I almost took your barb about pimping our advertisers seriously, but then again you claim that "people like bugs." You're kidding, right?

***"I'm so confident in the technology that I
bought the dvd100i drive today."***

The truth is, when I ask board vendors for their hot-stuff boards, they simply don't say, "Yeah, I'll send you an SiS chipset board!" We've written about SiS's chipsets in the past, and I was actually hoping a vendor *would* send me an SiS chipset with support for DDR333 and Pentium 4. But those boards just weren't available when we were testing for the January feature.

In general, the alternative chipset vendors, including SiS, have come a long way in terms of reliability and performance, and

Intel has in fact hurt its credibility with the 820 and MTH issues. However, when it comes to stability, Intel chipsets are still number one.

ONLY TIME WILL TELL

In the February issue, Logan Decker spent a lot of time beating up on the HP dvd100i DVD/CD burner because the +RW format is less compatible than -RW with other DVD drives/set-top players. Well, at the moment, I guess he's right.

Mr. Decker says, among other things, that the +RW format provides "too little, too late." I believe, however, that these criticisms are unfair and, more importantly, premature. While it's true that +RW is the last off the starting block, I expect it to gain a whole lot of ground in the next few months and to even pull ahead in popularity. Why? Because PC heavyweight Dell has selected +RW for its DVD-rewriteable drive. HP will also use its dvd100i drive in its own PCs, and if the HP/Compaq merger goes through, Compaq may switch from its DVD-R drive to using +RW. Furthermore, Sony, Philips, Dell, HP, Ricoh, and a couple others have announced plans to support and supply DVD+RW. In fact, Mr. Decker even admits in his review that the HP dvd100i outperformed the Pioneer -RW drive.

When you consider all of the above, plus the fact that the price has already dropped to \$500 since the

article was printed, you can see that the +RW format has legs after all. I'm so confident in the technology that I bought the dvd100i drive today.

—MARSHALL RAY

OPTICAL BULLY LOGAN DECKER RESPONDS: Yes, the DVD+RW folks got a beating in our review of HP's dvd100i, but we think they had it coming. After all, for three years they've been carrying on about a DVD-rewriteable standard that was better than all the others because of its greater compatibility with legacy players. It wasn't until nearly six months after the release of Pioneer's DVD-RW DVD burner that the +RW camp finally produced a working product—one that had far *less* compatibility than existing technology. Thus, "too little, too late."

But we never suggested that DVD+RW was going to buy the farm. In fact, in our review of optical-drive standards last year ("Beyond the X-Rating," September 01), we acknowledged that the standard had the support of many huge manufacturers (Sony, HP, Dell, et al) and was gaining enormous momentum, despite the absence of any shipping drives for the PC. We predicted that "DVD-RW will remain a technically sound but second-tier technology, while DVD+RW will match, and possibly overtake, DVD-RW in PC configurations and become the format of choice in next-generation set-top personal video recorders." Not to pat ourselves on the back, but six months later, that's pretty much what's happening out there.

Nevertheless, it's the early adopters—like yourself—whose enthusiasm for this

* 10:58 AM
Create new master CDs,
surf the Web and check
email simultaneously

* 4:30 PM
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presentation and relax

* 6:45 PM
Mix the latest hits on a CD

* 8:12 PM
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ultra-cool technology will ultimately decide which standard dominates in the future.

MACRO MANIA

My first computer was a Gateway 2000 486DX2 66MHz. It came with a programmable keyboard. The keyboard didn't require software to run. Here's how it worked: You enter into programming mode by depressing a special key. Next, you press the key where you want your macro to be stored. After that, you enter the keystrokes that you want to be recorded. The final step is to depress the special programming key to end the recording of your macro. I no longer have that keyboard, and I can't remember the model. I was told by a computer retailer that Gateway hasn't sold that type of keyboard in years. Are there any other companies that sell this type of keyboard?

—CHRIS WHITE

TECHNICAL EDITOR WILL SMITH REPLIES:

Oh, the days of yore.... We remember accidentally activating the program mode on that keyboard and typing happily away for five or six minutes before we realized what we'd done. While we weren't able to find a supplier for that particular keyboard, we did come up with something even better. The Z-keys Pro, from www.zmc.com, is a programmable macro keyboard. It's available in PS/2 and USB, and costs around \$150. It has 58 programmable keys, each of which can have 918 keystrokes programmed.

SURLY ABOUT OUR SURVEY

Just a quick note to say that I saw the survey [page 15 of the February issue], and would have filled it out to send you, but I didn't want to ruin my magazine by tearing out the page, and you won't accept photocopies of the survey page. Bad planning, in my opinion. Just curious as to how many folks *won't* fill it out for y'all for the same reason.

—PETER GRUEN

MANAGING EDITOR KATHERINE

STEVENSON REPLIES: We appreciate the sentiment behind your complaint. We know it's a sacrifice to tear out a page from the magazine and send it back

to us. However, if we allowed photocopies, we'd run the risk of receiving multiple submissions from a single reader, or possibly submissions from people who don't actually read the magazine but know someone who does. In both cases, the drawing not only wouldn't be fair, but we'd get skewed results from the survey.

And before you even ask: We put the survey on the back of an editorial page instead of an ad page for a very specific reason—advertisers get testy when magazines run content that expressly encourages readers to rip out ads. We make very few concessions to advertisers (we think our product reviews prove as much), but this is one of the small ones that we willingly indulge. ■

CUT, COPY, PASTE

In "Minor League, Major Performance" [February 02], the telephone number provided for Element PC was incorrect. To contact Element PC about the Titanium DDR—Patriot Edition (which received a 9/Kick-Ass in our roundup) or any of their other systems, call 877.769.9582.

We made a boo-boo when we captioned the photo of the PlexWriter 24/10/40A in January's Ask the Doctor. Although the caption suggested that a "recent firmware upgrade" disabled the drive's ability to make game backups, there is no evidence of this whatsoever. What is true is that copy protection routines are becoming more sophisticated, and having the latest model of any drive is no guarantee that you will be able to duplicate game discs. Not that you would.

In February's "Intel Finally Goes DDR" story, we mistakenly referenced a Suzuki motorcycle as an R1. No, we're not that dumb. We foolishly truncated the name of Suzuki's GSX-R1000 to R1, forgetting that main competitor Yamaha actually makes a bike called the R1. Falling into the ambiguity trap was embarrassing to say the least. Sorry, Josh!

COMING **NEXT**
MONTH
IN THE APRIL ISSUE OF
MAXIMUM PC

GeForce4: The Complete Story

We give you the in-depth scoop on the features, clocks speeds, and very first benchmarks of nVidia's polygon-pushing, console-stomping, next-generation GPU!

Digital Video Cameras under \$1,000

We rate and review the latest crop of digital video cameras that can be had for less than a grand.

Geek Test Redux!

Find out if you really are an Alpha Geek by taking the Maximum PC Second Annual Geek Test!

PLUS: the first Northwood P4 rig benchmarked and reviewed!



LETTERS POLICY: MAXIMUM PC invites your thoughts and comments. Send them to input@maximumpc.com. Please include your full name, town, and telephone number, and limit your letter to 300 words. Letters may be edited for space and clarity. Due to the vast amount of e-mail we receive, we cannot personally respond to each letter.

THE LAST WAR WILL BE FOUGHT BENEATH THE WAVES.

"The graphics are nothing short of spectacular"

"Winner of 2001 Action Vault Award for
Outstanding Achievement in Graphics"

-Action Vault

"It's simply stunning to look at."

-PC Gamer

"Easily one of the
prettiest damned games
we've ever played."

-Maximum PC

AQUANOX

It's deep. It's immersive. It's the end of the world - and it looks like nothing you've ever seen. Life came from the oceans. AQUANOX takes you back home in a fleet of screaming underwater killing machines. You're armed to the gills and you're looking at graphics straight out of the future. As mercenary, Dead-Eye Flint, you're in over your head. 30 single-player missions. Intense multiplayer modes. Warring governments. Masses of freebooting pirates. Hordes of godless monsters. And 360° of complete aquatic freedom. The future's history. Go down in style.

GO DEEP



VIOLENCE



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Quick Start

The beginning of the magazine, where articles are small

GeForce4 Revealed!

We give you a quick cheat sheet on nVidia's new Ti 4600

First things first: Unlike the GeForce3, which introduced programmable shaders to the game development community, the new GeForce4 doesn't represent a true revolution in 3D acceleration. But even though the GeForce4 doesn't play Michael Jordan to the GeForce3's Dr. J, history will still remember it as much more than a mere core and memory clock speed bump, à la the GeForce3 Ti 500. In fact, the GeForce4 core is remarkably similar to the Xbox's graphics processor.

Instead of completely reinventing its programmable shader technology, nVidia opted for an incremental upgrade, dubbed nfiniteFX II technology. This new pixie dust helps

GeForce4 Ti 4600 cards will feature a special fan that moves air across the memory.

account for some of the chip's 63 million transistors and should boost frame rate performance in all programmable shader games (though visual effects won't necessarily look any more spectacular). The most significant addition that nfiniteFX II

delivers is an extra programmable vertex shader—

bringing the chip's grand total

to two. This addition

more than doubles the vertex processing power of the GeForce4, and pushes the new card beyond the Xbox's 3D capabilities. In case you've forgotten, vertex shaders can provide games with ever-more complex 3D models and even previously out-of-the-question special effects like realistic-looking hair.

The GeForce4's pixel shaders also underwent a makeover; nVidia says they're about 50 percent faster than



Note the prop wash from the helicopter in this Comanche 4 screenshot. Only the GeForce4 version of the game has this exclusive effect.

the GeForce3's pixel shaders, thanks to pipeline enhancements and further optimizations to the chip's memory controller. These memory controller optimizations, which are part of the GeForce4's new Lightspeed Memory Architecture II, include occlusion culling, lossless compression, and an upgraded crossbar memory architecture.

■ Occlusion culling is a form of "hidden surface removal" that saves a videocard the trouble of rendering objects that won't ultimately be displayed.

■ Lossless compression lets a videocard compress textures and vertex data to further conserve memory bandwidth, with no loss of image quality.

■ The crossbar memory architecture, which fetches and stores data in the GeForce4's memory, received an upgrade in order to work with the GeForce4's massive 128MB of DDR memory.

These three technologies all work together to minimize the amount of memory bandwidth that's required to draw a scene onscreen.

Because the GeForce4 will ship with 128MB of RAM, running full-screen anti-aliasing at high resolutions will also be possible. Additionally, on-chip enhancements to the anti-aliasing engine will allow GeForce4 owners to run Quincunx anti-aliasing at the same speed as 2x anti-aliasing.

This technology uses sub-pixel localization to provide better-looking anti-aliasing without the large speed penalty that traditional anti-aliasing algorithms incur.

Not all of the GeForce4's improvements will be found in its core. Cards will feature a new heatsink/fan combo, too. It's a patent-pending design that will cool not only the 3D accelerator, but also its attendant memory. While we're on the subject of memory, it's also worth noting that the GeForce4 is the first 3D chipset we've seen that packages its DDR SDRAM in a ball-grid array instead of the traditional TSOP package. The ball-grid array allows higher speed memory, thanks to its tighter mounting tolerances.

Expect to see GeForce4 benchmarks in next month's issue.

GEFORCE4 TI 4600 SPECS

Code-name:	NV25
Core:	63 million transistors on a 0.15-micron process
Core speed:	300MHz
Memory:	128MB of 325MHz DDR SDRAM
Memory interface:	Ball-grid array
Price:	To be announced
Availability:	March

This GeForce4 sports two DVI outputs and nVidia's patent-pending heatsink/fan.

No Shaders for You!

Buying a GeForce4? Make sure you don't confuse the budget MX version with the big-boy Titanium version



Beware: The GeForce4 MX does not feature programmable shaders.

Thrifty videocard shoppers looking for an inexpensive version of nVidia's GeForce4 will probably be disappointed by the GeForce4 MX. While this budget chip more than triples the frame rate performance of the previous budget

chip, the GeForce2 MX, it doesn't include programmable shader technology. This means you won't be able to play DirectX 8 games in all their visual glory.

But this doesn't mean the new MX chip completely abandons all the features of its stellar GeForce4 older brother. For starters, it includes Lightspeed Memory Architecture II (LMA II), which drastically increases the memory bandwidth of videocards. With LMA II, the GeForce4 MX will be the first budget nVidia chip to support 128-bit DDR memory. The GeForce2 MX supported only 128-bit SDRAM or 64-bit DDR.

Because it lacks the gamer-centric programmable shaders of the GeForce4 and GeForce3, nVidia will likely pitch the GeForce4 MX to office workers and occasional gamers. GeForce4 MX cards are expected to be on shelves by the time you read this.

CPU Vendors Say 'Let's get Small'

Intel transitions to 0.13-micron for its mobile lineup and unleashes a wave of teeny-tiny CPUs

Intel's push to a more efficient—and more profitable—0.13-micron process picked up steam early this year when the company announced that its entire mobile lineup was using the new process. But what's been lost in the shuffle is the fact that a whole slew of non-mobile Intel CPUs also segued to 0.13-micron.

The list includes: a 1.3GHz Celeron, a 2.2GHz Xeon and, of course, the 2.2GHz Northwood Pentium 4, which we reported on last month.

Chip experts say it's a good move for Intel because it allows the company to make far more CPUs on a single silicon wafer—and efficiency saves money. A CPU made on the

0.13-micron process is almost 50 percent smaller than one made on the 0.18-micron. You do the math.

AMD, meanwhile, might argue that it still actually has the upper hand because the basic Pentium 4 core is still a fat 146mm² in size. The Athlon XP on the older 0.18-micron process is 128mm². AMD expects that when it moves to a 0.13-micron process this year with its CPU code-named "Thoroughbred," the die will shrink to about 80mm².

Intel says next year's target is 0.09-micron. After that, the company forecasts 0.065-micron by 2005, 0.045-micron by 2007, and a minuscule 0.032-micron process by 2009.

THE LITTLEST SOLDIERS: PUTTING THIS YEAR'S WEE CPUs INTO PERSPECTIVE

CPU	Process	Transistors	Die size	L2 cache
1.4GHz Pentium III-S	0.13-micron	44 million	81mm ²	512KB
2.2GHz Pentium 4	0.13-micron	55 million	146mm ²	512KB
1.67GHz Athlon XP	0.18-micron	37.5 million	128mm ²	256KB
2GHz Pentium 4	0.18-micron	42 million	218mm ²	256KB
733MHz Pentium III	0.18-micron	28 million	106mm ²	256KB
500MHz Pentium III	0.25-micron	9.5 million	128mm ²	external



Who Will Swing AMD's Hammer?

Hammers can build things or break things, depending on the carpenter's skill. The same goes for AMD's future Hammer-family processors. They might build something (a new platform for 64-bit software) or break something (AMD's hopes for gaining share in the server market). I'm worried AMD will end up with a toolbox full of nice Hammers, but not enough carpenters.

Background: The Hammer family introduces x86-64, AMD's 64-bit extension to Intel's 32-bit x86 processor architecture. The first two Hammer processors will be Clawhammer for desktop PCs and Sledgehammer for servers. They share the same basic processor core, and Sledgehammer has extra features for multiprocessing. Clawhammer is scheduled to ship in the fourth quarter, followed by Sledgehammer in 2003.

AMD's 64-bit extensions are sensible, though not as luxurious as I expected. For instance, AMD will double the number of general-purpose registers (GPRs) to 16, double their widths to 64 bits, and also double the number of 128-bit SSE registers to 16. Registers are internal memory slots for data, so the larger register space will allow 64-bit programs to spend less time shuffling data among a limited number of registers. That's good.

But RISC processors like the PowerPC typically have 32 GPRs—twice as many as the CISC-based x86-64. Why did AMD stop at 16? AMD says that program code for CISC processors is less register-intensive than RISC code, and that simulations revealed a diminishing rate of return with more than 16 GPRs. I haven't seen those simulations. But modern CISC code is more like RISC, and 16 registers seems stingy for a 64-bit architecture.

One potential downside of a 64-bit processor is code bloat caused by longer instructions and data. x86-64 appears to be an exception. AMD says the 64-bit code is only about 5 percent larger, thanks to efficient register usage, data handling, and instruction encoding. If that's true, then it's a trifling tax to pay for 64 bits.

The larger question is software. All the major server vendors except Sun have already adopted Intel's IA-64 architecture, which isn't compatible with x86-64. If Sledgehammer doesn't appear in enough servers, software vendors can't justify developing x86-64 applications. Of course, x86-64 is also 32-bit compatible, so nobody will end up with a completely useless Hammer. But the 64-bit features will be wasted without 64-bit software. AMD needs to open a significant price/performance advantage over IA-64 to attract server vendors and developers. Nobody needs a 64-bit Hammer to pound a 32-bit nail.

Tom Halfhill was formerly a senior editor for Byte magazine and an analyst for Microprocessor Report. He is now a technical writer/analyst in Silicon Valley.

Philips Moves to Stymie Copy-Protection



Record labels that are lacing their audio CDs with copy-protection might be running afoul of trademark laws. Tech company Philips says it has asked the record labels to print disclaimers on the copy-protected CDs, warning consumers that the albums aren't spec-approved audio CDs, and therefore may not work in all CD players. Philips helped create the audio CD spec with Sony in 1978, and has control of the logo and trademark. The goal of the record companies is to protect their investment by creating audio CDs that play on traditional CD players but not in computers.

Whatever Happened to the "Bohemian Espresso House"?

The city of Garden Grove, CA has passed a ban on new cybercafes after a spate of violence, including the stabbing death of a man outside one cafe. The city, which sports the catchphrase "youth and ambition" in its logo, will stop granting permits for cybercafes, and existing

cafes must install security cameras and limit hours. Police say numerous fights have broken out in the parking lots outside the cafes. In one recent skirmish, police say, a multi-player gaming clan actually took on another clan with baseball bats and wrenches.



Microsoft Takes Offense at "Lindows"

Microsoft is suing to prevent a company from naming its Windows emulation program "Lindows." The emulator would let consumers run major applications, such as *Office 2000*, on top of GNU/Linux. Microsoft says the company is trying confuse consumers into thinking that Lindows is Windows. The Lindows company says the suit is without merit and is challenging it.



Lindows was started by Michael Robertson (of MP3.com fame), who says the emulator should be finished by next year, but some Linux experts are skeptical of the Lindows timetable.

Gateway PCs Optimized for Everquest

Hoping to bolster its business, PC maker Gateway has begun marketing some of its PCs directly to people who play the popular online game *Everquest*. The Everquestian PCs include 2.2GHz Pentium 4 CPUs, Radeon 8500 graphics,



120GB hard drives, and 1024MB

of PC800 RDRAM. The PCs also come bundled with three months of access to *Everquest*. While the specs may sound like overkill, Sony's popular online game recently drew flak for needing as much as a 512MB of RAM when all its features are enabled.

HELPFUL HINTS

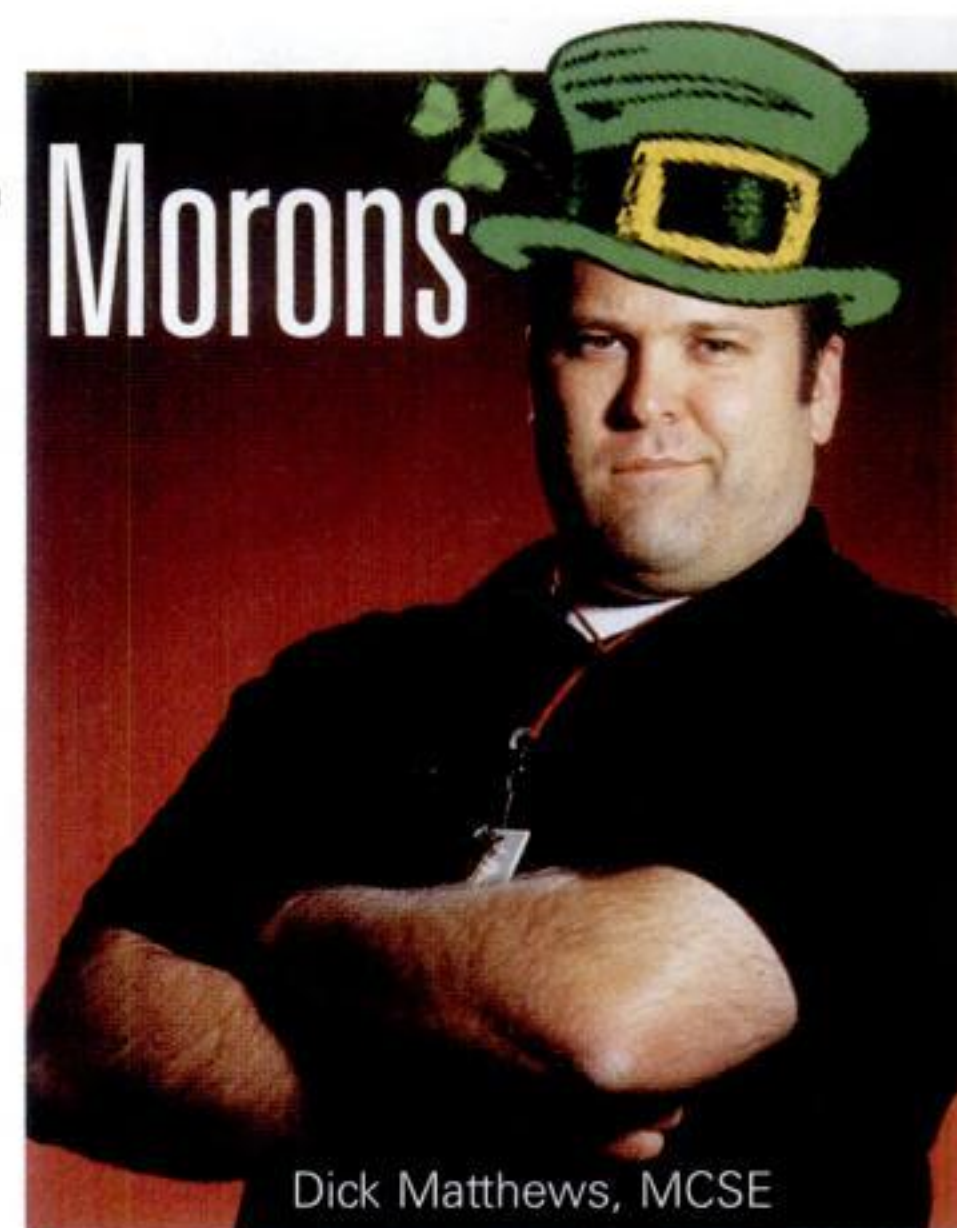
Windows Tips for Morons

Top o' the mornin' to ya—chowderheads

Listen up, ladies. It's March, and that means it's time for two things: Saint Patrick's Day and spring inventory. Inventory time always makes me testy, mainly because I'm stuck inside the office, counting printer cartridges while those boy-men from accounting are at that upscale pseudo-Irish pub, Seamus McBride's, swilling green beer. Sigh. Such is the life of a committed MCSE.

This month, you get two glorious tips. While I love almost every aspect of Windows XP, the new "improved" search menu—complete with a cutesy dog reminiscent of the asinine Microsoft BOB software—pisses me off more than Windows ME. After digging around in the Registry, I came up with a way to get rid of that stinkin' dog for good. All you need to do is start Regedit, then browse to `HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\Cabinet State\` and create a new String Value called `Use Search Asst.` Then set the value of that key to No. This will revert your system search tool to the Windows 2000 default, suitable for people who know that a filesystem is more than just a bunch of stupid folder icons.

Once you've evicted the search dog, you can de-idiot-proof your XP machine a little more by getting rid of all those annoying pop-up balloon tips. From inside Regedit browse to `HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\Advanced\` and create a DWORD key named `EnableBalloonTips`. Set the value to 0. Once



Dick Matthews, MCSE

you reboot, all the "helpful" WinXP balloon pop-ups will be gone.

An important note about using Regedit: If you type something in wrong, or mash the delete key at the wrong time, or play with things that your feeble little mind can't comprehend, then you could quite possibly destroy your Windows installation. Even though Windows XP is less prone to total annihilation than earlier versions, no Registry backup software can counteract the power of even the lowliest dumb-ass.

OK, so I'm not all *that* bitter that I had to work on St. Paddy's Day, but I did leave behind an extra special surprise for the schmucks down in Accounting. It's now stuck in their printer posing as a toner cartridge, but it started its life as a haggis in the deli case at MacAndrews's market. Yeah, yeah, I know, that's Scottish—*whatever*.

Blue-Laser Burners Inch Closer to Reality

With any luck, 30GB media will be ready before we're too old to enjoy it

Blue-laser recording devices could be the technological equivalent of global warming—we've heard about it for years, but we're still not wearing our shorts in February. That may change in the next 12 months, because Toshiba is readying its first blue-laser products, which promise to pack insane amounts of data onto optical discs. At the recent Consumer Electronics Show in Las Vegas, the company demonstrated a working blue-laser device that was about the size of a VCR, and announced that consumer devices and media will ship sometime in 2003.

Each layer of a Toshiba disc will store 30GB of data, which equals about three hours of high-definition video and audio. Current DVD media can store only 4.7GB. Toshiba's blue laser operates in the 405 nanometer range, which is much shorter than the 650nm range used by lasers in current CD and DVD devices. The shorter wavelength lets the laser resolve smaller dots, which in turn leads to higher capacities.



The Toys Are Back in Town

We sincerely hope you have a PC, because you'll need one to get the most out of these devices

Garmin Rino

Two-way radios are convenient, but not if all your conversations are spent trying to figure out where everyone is located. Enter Garmin's new Rino 110 and Rino 120, which combine GPS units with traditional two-way radio technology. When another Rino user is talking on your channel, the unit will display that person's location on your Rino's screen. The Rino 110 includes a no-frills GPS screen, while the Rino 120 adds built-in basic maps of North and South America. If you're a true power user, you can use your PC to download up to 8MB of detailed street maps to flash memory. Both units are waterproof and support two-mile FRS frequencies and five-mile GMRS frequencies, as well as the new WAAS radio systems for higher accuracy. The units are expected to go on sale this spring with prices of \$210 for the 110 and \$311 for the 120. www.garmin.com



Creative Labs NOMAD Jukebox 3

Downloading 20GB of MP3s through a USB connection just doesn't cut the Horsey Sauce anymore. To address this shortcoming, Creative Lab's upcoming NOMAD Jukebox 3 will let you download songs through a high-speed FireWire interface—which the company's Sound Blaster Audigy soundcard conveniently supports. With an upgrade to dual lithium-ion batteries, the new NOMAD can play up to 20 hours before requiring a recharge. Other features include Smart Volume, which intuitively adjusts the volume of songs during playback, and a scroll-wheel to help you navigate the control menus. An upcoming version will feature 40GB of storage. The 20GB version is expected to retail for about \$400 this spring. www.nomadworld.com



Wherify GPS Personal Locator

If you've ever fretted about your child being kidnapped or wandering away, Wherify's new GPS Personal Locator could be the answer. Integrating a GPS unit, PCS phone, and pager into a wrist band, the GPS Personal Locator will let parents query the unit through a web browser, which will then display the child's position on a street map. Ingenious! Can we attach some to our digital cameras? They seem to have a habit of wandering away.

Once locked onto a child (or camera), the device can't be removed without the use of an electronic key, or through a web browser command. The child (or camera) can't use the device as a phone, but by pressing two buttons, Personal Locator will dial 911. The GPS Personal Locator is expected to cost about \$400, and will require a monthly service charge. It should be available by spring of this year. www.wherify.com



Romero vs. Carmack



Why someone would want to yank the gently rotting corpse of Jon Romero's career back into the cruel sunlight is beyond me. Isn't it enough to be eaten by worms? Do we need to add buzzards to the devil's feast?

Yet in a piece for Salon.com, former *Daikatana* team member and Romero buddy Christian Divine lamented the loss of that money-losing, bloated failure *Ion Storm*. The piece was promptly pounced on by bitter ex-*Ion Stormers* for its errors, but it also triggered an interesting response from Romero's former partner, the normally taciturn John Carmack. On a thread at Slashdot.org, Carmack took aim at the whole idea that "design is law": "Romero's primary mistake was believing that abstract creative design was a primary, or even significant, part of a successful game. The 'strategic creativity' in a game is less than 1 percent of the effort, and if you put that on a pedestal, you will de-emphasize where all the real work needs to be done."

If this sounds like the tech end talking smack about the creative end, it is and it isn't. *Id's* games have always been short on the kind of *Half-Life* triggered content that conveys narrative, but they're not dull or empty. "Probably everyone reading this has done some 'game design' while talking with friends..." Carmack elaborated. "There is not a hell of a lot of difference between what the best designer in the world produces and what quite a few reasonably clued-in players would produce at this point. The real value in design is the give and take during implementation and testing. It isn't the couple dozen decisions made at the start, it's the thousands of little decisions made as the product is being brought to life and constantly modified as things evolve around it. The games with 500-page design documents before implementation are also kidding themselves, because you can't make all the detail decisions without actually experiencing a lot of the interactions."

Elements of a game don't gel independently, but together. Design (the structure of the game) is shaped by technology. The core philosophy of *Ion Storm*—that "design is law"—is what brought it down. Carmack's "1 percent strategic creativity" rule echoes Thomas Edison's maxim that "invention is 1 percent inspiration and 99 percent perspiration." Everyone *knows* what makes a good game. Ideas are easy. The hard part is in making it.

Tom McDonald has been covering games for countless magazines and newspapers for 11 years. He lives in the New Jersey Pine Barrens.

Head2Head

A showdown among natural competitors

THIS MONTH: IDE vs. SCSI Hard Drive Conflict

For years, SCSI hard drives have been losing favor with even the most hardcore PC power users. The long story on why this is happening can be found on page 46, but the short is that IDE drives have slowly but surely closed the performance gap that's always separated the two drive families. But has the gap finally been sealed shut? We decided to find out in a hard drive battle of the ages.

We took the fastest IDE hard drive we could find—the 100GB Western Digital 1000BB Special Edition—and pitted it against the heart-pounding speed of the 15,000rpm Seagate Cheetah X15-36LP. Because *Maximum PC* is a magazine for home users, we looked at these drives from a desktop/workstation perspective rather than from a server perspective. Here are all the gory details.

—JOHN TUMMINARO

WESTERN DIGITAL 1000BB SPECIAL EDITION



Performance: The Western Digital drive ran neck and neck with the Seagate throughout our entire series of benchmarks, giving up the crown in only *RamDisk* read tests. For this you can thank a kick-ass areal density—33GB per platter compared with the Seagate's 9GB—and a monster 8MB cache (which, by the way, makes this IDE drive a "Special Edition"). **Winner: Tie**

Heat & Noise: Because the Western Digital drive spins at one-half the speed of the Seagate, it produces less heat and noise. In fact, we heard nary a peep out of the IDE drive, even under heavy stress. And as far as heat protection goes, you'll never need to worry about active cooling unless your case is as stuffed as Angelina Jolie's brassiere. During stress testing, the IDE drive registered an external temperature of 89°C. **Winner: IDE**

Price: No contest here. For just a few bucks more than what you would pay for the Seagate drive and its requisite Ultra160 controller card, you could buy *three* Western Digital drives (at \$339 a piece) for 8.3 times more storage capacity than the single SCSI drive. **Winner: IDE**

Specs & Features: Although both drives sport an 8MB cache, the Western Digital's 7200rpm spindle speed and 8.9ms average access time are slower than SCSI's finest. And while the IDE bus's maximum 133MB/sec throughput is dwarfed by SCSI's 160MB/sec ceiling, the story gets worse when you realize the Western Digital drive is only spec'd to burst at 100MB/sec. Features such as S.M.A.R.T. drive monitoring are nice, but really don't hold up to SCSI's plethora of gadgetry. **Winner: SCSI**

Storage: With a 100GB capacity, the IDE drive absolutely smashes the 36GB SCSI drive in this battle. Adding insult to SCSI's injury, Western Digital is already shipping a 120GB/2MB cache version of this drive, with a 120GB/8MB cache version to follow. **Winner: IDE**



MAXIMUM PC VERDICT

1000BB Special Edition
WESTERN DIGITAL

THE REALLY REALLY GOOD NEWS

Fastest, bestest IDE drive ever. Offers greater capacity than the IBM 60GXP and comes with an 8MB cache.

THE SOMEWHAT BAD NEWS

A bit pricey.

www.westerndigital.com

\$339

10

SEAGATE CHEETAH X15-36LP

Specs & Features: A 15,000rpm spindle rate and 3.7ms access time trump the fastest IDE drives by a considerable margin. Even more importantly for server applications, SCSI's special features—such as command queuing, ECC, 15-devices-per-channel capacity, and hot plug-ability—give it a decisive advantage over IDE in the raw specs and features battle.

Winner: SCSI

Storage: Although SCSI drives in excess of 100GB are available, they sacrifice some of their performance benefits for the sake of increased capacity. Even worse, their cost as well as their power and cooling requirements put them way out of the range of the average consumer pocketbook. To wit, the X15's 36GB capacity doesn't look so hot, clocking in at about one-third the capacity of the Western Digital drive. **Winner: IDE**

Heat & Noise: We were pleasantly surprised by the Seagate's low idle noise—until we began running our benchmarks, at which point we thought we had a cat that was trying to hack up a furball. And because of its wacky spindle speed, a drive cooler is highly recommended to keep this sucker's temp down. During stress testing without dedicated cooling, the SCSI drive registered an external temperature of 116°C. **Winner: IDE**

Performance: We're pretty sure that the Seagate would have whupped our IDE drive in server-oriented benchmarks, but we chose to focus on real-world desktop performance. Although our *RamDisk* tests gave the Seagate significantly faster read speeds, the drive lagged behind the Western Digital in write tests. Altogether, the Seagate showed no decisive performance victory over its IDE counterpart, despite twice the spindle speed and an equally large cache. **Winner: Tie**

Price: The Seagate Cheetah X15-36LP, along with the \$322 Adaptec SCSI controller that we used, will run you well over a grand—all for 36GB of space. Ouch. If you're the type who checks pay phones for loose change, look to IDE for the bargain of the century. **Winner: IDE**

THE UPSHOT

While our real-world benchmark results are by no means definitive, they do suggest that IDE can certainly give you all the performance you need when doing regular-old desktop work. Sure, SCSI is nice for bragging rights, but who wants to deal with the extra cost and complexity? SCSI still has its place in high-end server configs where seek times and multitasking are essential, but for the desktop user, SCSI drives are simply overkill. And not overkill in the good way, but rather overkill in the "burn-your-money-for-absolutely-no-reason-whatsoever" way. ■

DARE TO COMPARE

IDE VS. SCSI

	Seagate X15-36LP	Western Digital 1000BB-SE
SYSmark2000 OP	122	122
Premiere Output to AVI	594 sec	604 sec
SoundForge Open File	63 sec	60 sec
SoundForge Resample	557 sec	561 sec
RamDisk write	34 sec	28 sec
RamDisk read	19 sec	30 sec

NOTE: Tests were run in our standard zero-point reference system. The *RamDisk* benchmarks measure the time it takes to read and write 550MB of data to or from a 550MB RAM disk under Windows XP. See the benchmarking guide at Maximumpc.com for details.

MAXIMUMPC VERDICT

Cheetah X15-36LP
SEAGATE

THE RELATIVELY GOOD NEWS

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8

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WatchDog

Maximum PC takes a bite out of bad gear

THIS MONTH: The WatchDog goes after...

> ThermoDynamics

> Viking Computer

> Photopoint

> Component Authority

Another Few Bite the Dust

In October, The Dog alerted you to reader complaints about STEP ThermoDynamics (www.step-thermodynamics.com). Apparently, the situation at the small component reseller has gone from bad to worse to fatal. According to the Cleveland, Ohio Better Business Bureau, the company may have completely vaporized. The BBB says it suspended STEP's membership in the organization because of consumer complaints and is considering terminating the company's membership altogether. Not that canceling BBB membership matters at this point—the bureau also reports that mail delivered to STEP's address on Aurora Road in Cleveland has been returned as undeliverable. "The current status of this firm is not known," the bureau reports; "the company may be out of business." Echoing The Dog's previous warning, the bureau advises customers to use "extreme caution" when ordering products from STEP's web site; however, as of press time, the online store appeared to be off-line, although the company's main site continues to function.

The Dog also has an update on the MIA status of VikingComputer.net. Readers have reported experiencing problems obtaining product from the store, and the company has failed to respond to queries by both the readers and The Dog. "I had made several purchases there before they closed," says reader Jim Stephens. "Viking Computers has gone out of business. They locked their doors about two months ago but still have their 'Grand Opening' banners up."

I Want My Antec

DEAR DOG: I recently purchased what I thought was an Antec SX1030 case from a computer show. After I got home and gave it a closer look, I found that the drive rails said "Chieftec," and the power supply isn't an Antec like in my friend's Antec case. What gives? Did I get an Antec or not?

— JOHN D.

THE DOG RESPONDS: You're not the only person to be confused by the Antec/Chieftec similarities. In fact, Antec itself issued an alert to customers. "It has come to our attention that some unscrupulous resellers are selling cases from other companies as Antec cases. These resellers are mainly on the Internet where it is more difficult for you to evaluate the product before you buy," the company stated in its warning. Company officials tell The Dog they have been contacting stores to request the correct labeling of the cases they're selling.

John, you have a case made by Chieftec, the supplier of Antec's popular SX1030 and SX1040 line of cases. Since Chieftec does manufacture the case for Antec, there shouldn't be many quality differences. The main problem will be the warranty. If you expected to get Antec's three-year warranty, you're out of luck. You've already noticed the other problem with the case—the power supply isn't made by Antec. Various versions of the case sold on the Internet don't have Antec power supplies, and some may not come with all the fans that come with the Antec version. If you're set on getting a real SX1030, there are a few things you should look for, according to Antec:

- Make sure it has an Antec power supply.
- Check to see if it has an Antec part number such as SX1030B or SX1040.
- Ask about the length of the warranty. An Antec warranty is three years.
- The box should clearly say "Antec" on it.

There's nothing wrong with what Chieftec is doing; it's the vendors that are misrepresenting the Chieftec cases as Antecs.

I'm Not Dead Yet. I Feel Happy...

DEAR DOG: In your response to Jim Tourville in the "The Drivers Are Always Broken" [December 2001], you mention the 3dfx Voodoo3 2000 as an example of a card that "...you can for-

get about finding functioning drivers for...[since 3dfx is gone]."

This is actually false, as there are now third-party drivers for the 3dfx

"You're not the only person to be confused by the Antec/Chieftec similarities."

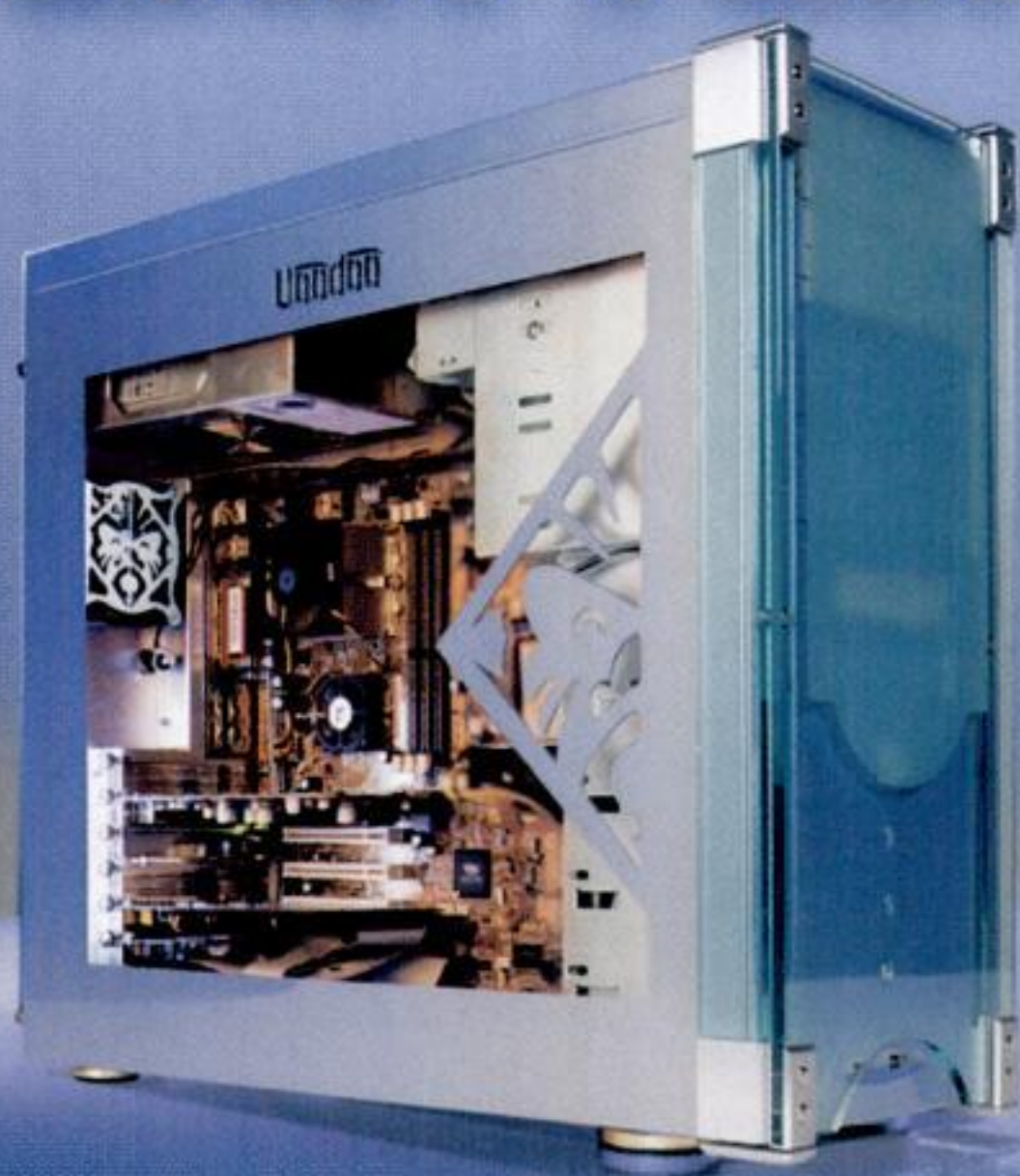
line of cards that work quite well in Windows XP and actually turn out decent frame rate numbers. There are still thousands of 3dfx



Authentic Antec boxes come in boxes clearly marked "Antec"

Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic The Dog on them by writing watchdog@maximumpc.com. The Dog promises to get to as many letters as possible, but only has four paws to work with.

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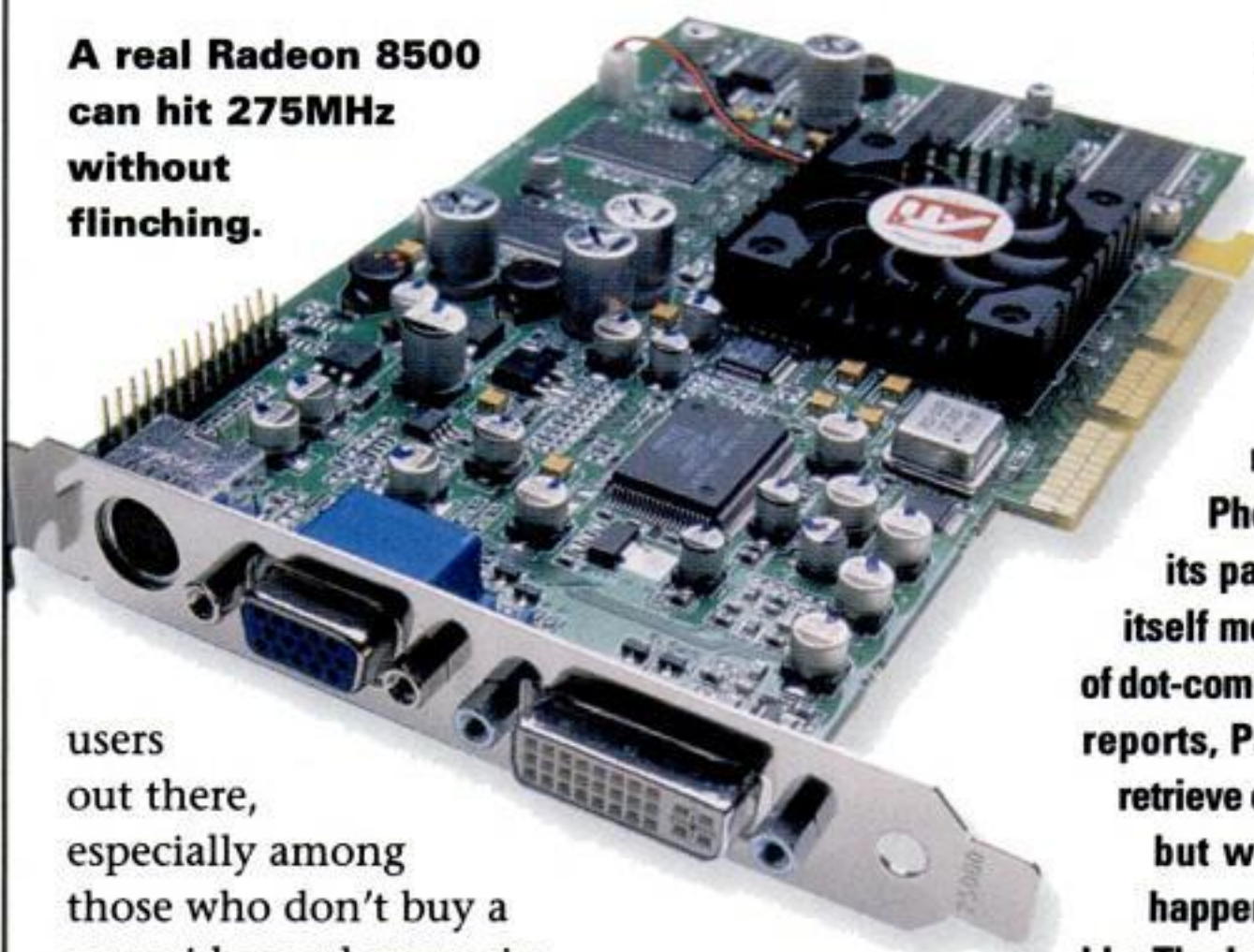
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those who don't buy a
new videocard every six
months. The last 3dfx cards are far
from the end of their lives and still work
great with almost all games.

3dfx had far superior driver support
than both ATI and nVidia. And consider-
ing that most game developers test their
games on the WHQL releases, there should
be no problem. (I have yet to play a game
that doesn't operate at outstanding frame
rates with the 1.04.00 WHQL drivers on
my Voodoo5 5500). I do realize that this

to get my pics back
somehow. Can you
help me?

— NICK T.

THE DOG RESPONDS:

Bad news, Nick. Like so
many other web services,
Photopoint.com bit the dust, and
its parent company, Pantellic, has
itself melted into the primordial ooze
of dot-com casualties. According to news
reports, Pantellic announced plans to
retrieve customer files from the servers,
but wasn't sure when that would
happen, or if it would even be possi-
ble. The lesson here is that anyone who
uses an Internet storage service, for pay or
for free, should make a backup of all documents.

Hello... Is There Anybody in There?

DEAR DOG: I recently ordered
an ATI Radeon 8500 from
ComponentAuthority.com for \$215.
The card was guaranteed at a 275/275
clock speed with 3.6ns RAM. When I
got the card it was a Radeon LE, it was

***"I want my Radeon to be clocked at the correct speed, and I hope no one else
orders from a company that doesn't even respond to phone calls."***

will change with the introduction of
DirectX 9, but it's going to be a long time
before we see games that use DirectX 9.

I'm including a link to the third-
party drivers. Numerous 3dfx enthusi-
asts have been able to tweak them for
full OpenGL and Glide support under
Windows XP: [www.voodoofiles.com/
3dfxhelp.asp](http://www.voodoofiles.com/3dfxhelp.asp). For excellent user-based
tech support of 3dfx products, visit this
x3dfx Community for great people and
great help at pub43.ezboard.com/bx3dfx.

— BEN BRAUCHER

THE DOG RESPONDS: Ben, The Dog doesn't intend
to insult the Voodoo-lovin' 3dfx fans out there, but
does continue to hold the opinion that it's not a good
idea to purchase any 3dfx hardware at this point.

Gone But Not Forgotten

DEAR DOG: What happened to
Photopoint.com? That web site was a
great online photo album resource. I even
sent the company \$20 for more space on
its web site to upload pics. Now it's gone,
and I can't log on to the site anymore.
Photopoint.com is a dead link. I'm not
really worried about the money I paid,
but there are a lot of pics on the web site
that I don't have anymore because of a
recent hard drive crash. I would really like

clocked at 230/230, and the price on the
web site was changed to \$255. I have
called every day since Christmas, and
either no one has picked up the phone
or it's busy (probably with another per-
son like me on the line hoping someone
will pick up). I want my Radeon to be
clocked at the correct speed, and I hope
no one else orders from a company that
doesn't even respond to phone calls.

— MICHAEL PINTAR

THE DOG RESPONDS: After receiving Michael's
message, The Dog tried to contact Component
Authority for its side of the story. Unfortunately,
as was the case with Michael, no one from
Component Authority responded to the several
e-mails, and a live person couldn't be reached
at any of the phone numbers listed for the busi-
ness. The Dog's attempts to contact the compa-
ny's owner at home were also in vain.
Interestingly, the local Better Business Bureau
opened a file on Component Authority in early
December but said it didn't have enough data to
determine the integrity of the company. The BBB
may not be able to determine the company's sta-
tus, but Component Authority's treatment of its
customers, not to mention the cold shoulder it's
given The Dog, earns it a trip to the Dog House.
Consider Component Authority off limits for pur-
chases until further notice. ■

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TURBO-COOL 450 XE (SuperMicro P4DC6, DCE)

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¹ As measured by PC WorldBench 4 (higher no. is better).

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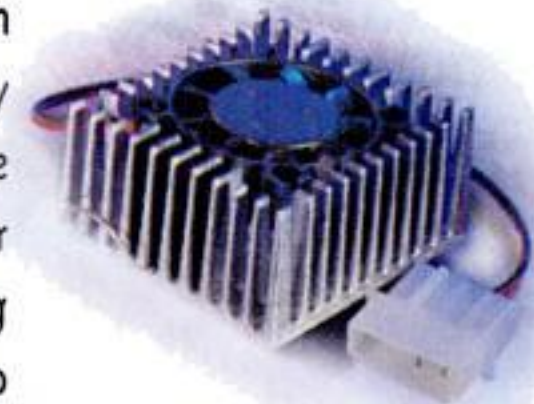
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Build It

Been thinking about building your own Dream Machine? We bet you have. If you're like most PC enthusiasts, you want to experience true pride of ownership—that indescribable feeling one gets from having built a computer completely from scratch. Sure, you can have fun with a pre-fab machine, but you'll never really be able to call it your own flesh and blood.

So it's time you built your very own. On the following 15 pages, you'll find all the blueprints you'll need to conceive, build, and troubleshoot your own PC screamer. You'll get to decide your personal Dream Machine's exact component configuration, one tailored to your personal passions and proclivities. Gamers can splurge on the very, very best video-card and dispense with the funky RAID setup. Videographers can ditch the DVD-ROM and CD-RW drives in favor of a do-it-all DVD/CD combo burner.

You make the choices, and you decide on the compromises—that is, if you intend to make any compromises at all.

This guide is just a starting point to help you get moving on the fundamentals of PC building. Where you take this project from there is limited by only your budget and imagination. You can buy every part we used in the step-by-step tutorial and configure your PC as a mirror image of our own. Or, you can go hog wild with 1GB of memory, SCSI RAID, and twin plasma screens hooked up to a dual-monitor videocard. Get the idea?

In addition to showing you how to put it all together, you'll find comprehensive guides to choosing your motherboard, power supply, and cooling solutions. We also give you

How to construct the ultimate PC in less than three hours. All your questions answered, every step explained.

By the Maximum PC Staff

special tips specific to Athlon and Intel systems, our best troubleshooting tricks, and even a quick tutorial on how to poke a blow-hole in your case for extra credit.

If you're going to take the plunge, make sure you read the entire article from beginning to end *before* you begin buying components and snapping Part A into Part B. Building a PC isn't difficult, but paying close attention to details is absolutely necessary if you want a quick, trouble-free construction process.

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45 Parting shots

Shopping List

Here's a list of all the parts we used for the PC showcased in this article. Instead of going for top-of-the-line components across the board, we chose reliable parts that we knew would work well together. Feel free to use different components in your own creation, but make sure they're all compatible with each other. You might also want to verify that all your parts come with WinXP drivers, if that's your operating system of choice.

COMPONENTS

CASE PC POWER AND COOLING MID-TOWER

This is a relatively nondescript mid-tower case, except for one defining feature: its removable motherboard tray, which makes swapping mobos in and out of the case a relatively simple affair. www.pcpowerandcooling.com, \$42

POWER SUPPLY TURBO-COOL 300 ATX 300W

When you're building a machine from scratch, don't skimp by buying a generic, underpowered power supply. Wimpy power supplies can degrade performance, instigate crashes, and even lead to hardware failure. www.pcpowerandcooling.com, \$100

MOTHERBOARD

SOYO SY-K7V DRAGON PLUS AMD SOCKET-A

The overclocking-friendly Soyo Dragon Plus is based on our current favorite Athlon chipset, the KT266A. It supports a 200/266MHz system bus and unbuffered PC1600/PC2100 DDR memory, includes integrated Ethernet and RAID controllers, and has a spiffy black and purple color scheme. www.soyousa.com, \$130

CPU AMD ATHLON 1800+ (1.53GHz)

We chose the Athlon XP 1800+ for great performance at a reasonable price. The CPU runs at 1.53GHz on a 133MHz double-pumped bus. www.amd.com, \$180

MEMORY 256MB CRUCIAL PC2100 DDR CAS2

PC2100 DDR memory is as fast as memory gets for the Athlon right now. Running on a double-pumped

133MHz bus, our 256MB stick feeds the hungry Athlon. www.crucial.com, \$75

HARD DRIVE 120GB WESTERN DIGITAL WD1200

The WD1200 packs a 2MB cache and boasts 120GB of storage. That's more than enough space for all our MP3s and games. www.westerndigital.com, \$255

VIDEOCARD LEADTEK WINFAST GEFORCE3

It's not quite as fast as the fastest GeForce3 Ti 500s, but we were able to get a scorching good deal on this WinFast board. www.leadtek.com, \$250

SOUNDCARD CREATIVE LABS AUDIGY X-GAMER

The 24-bit audio of the Audigy isn't just marketing hype. We prefer the Audigy's sound output of music, games, and just about everything else. www.creativelabs.com, \$75

CD-RW PLEXTOR PLEXWRITER 24/10/40

Plextor makes damn good CD burners, plain and simple. The 24x PlexWriter will burn a full 72-minute CD in just under four minutes and features BurnProof technology as well. www.plextor.com, \$190

DVD-ROM PIONEER 16X DVD-116

Why do you need a DVD-ROM drive? To watch DVD movies and install the *Baldur's Gate* DVD, of course! www.pioneer.com, \$70

FLOPPY DRIVE MITSUMI

OK, floppy drives are a little old-fashioned, but they cost just \$15, and at least once or twice a year you'll

be glad you have one. www.mitsumi.com, \$15

OPERATING SYSTEM WINDOWS XP PROFESSIONAL

Windows XP represents the convergence of Microsoft's workstation and consumer OSes. There's absolutely no reason to run any other operating system. www.microsoft.com/windows, \$200

INCIDENTALS

ARCTIC SILVER II COMPOUND

This compound has a reputation for being the best thermal conductor around. You'll need it to affix the heatsink to the CPU. www.articsilver.com, \$8

SCREWDRIVER

Any Phillips head screwdriver will do. If you don't have one of these, then you should just go out and buy a PC from a safe, reliable vendor like Dell, Compaq, or Gateway.

PLIERS

Sometimes you just need a pair of pliers, whether it's to pick up a screw that fell between two PCI cards or to dislodge a stubborn motherboard stay. Available at your local hardware store for \$4.

MANAGING EDITOR KATHERINE STEVENSON

When you'd rather sit around watching "South Park" reruns instead of completing the PC-building project you began, it helps to have a Managing Editor around poking you in the back of the head with a sharp pencil. Thanks, Katherine!

Safety Tips

An ounce of prevention is worth a pound of fried hardware—five crucial safety tips for PC builders.



Unplug the power supply!

Don't work on your PC with the power supply still plugged into the wall. Even when the PC is off, the power supply transmits a small amount of electricity to the motherboard, and removing components with the PC still plugged in could fry them.



Static be gone!

Static electricity can, and does, kill computer components. So pick up a cheap anti-static strap at the local electronics store, and make sure it's connected to something grounded.

Don't start your building project on the shag carpet of your living room, and for God's sake, don't build the PC while dressed in a polyester leisure suit. At the very least, touch your PC's power supply, or some type of metal object that's grounded, before working on your PC.



Clean the sink!

Today's high-performance heatsinks and CPUs need to be in firm contact with each other to dissipate heat properly. If they're not, your CPU can crack. If you're reusing an old heatsink, make sure you use rubbing alcohol to thoroughly clean off the old thermal goop, and apply just enough thermal compound to cover the core. Don't apply so much that it oozes out and shorts out contacts.



Be an AGP pro!

When inserting a regular AGP card into an AGP Pro socket, make sure you don't hammer the card into the wrong part of the socket, as it may short out your mobo or videocard. Most AGP Pro sockets have safety tabs to keep the card from being inserted incorrectly, so don't remove these tabs unless you absolutely need to.



Insert your cable slowly!

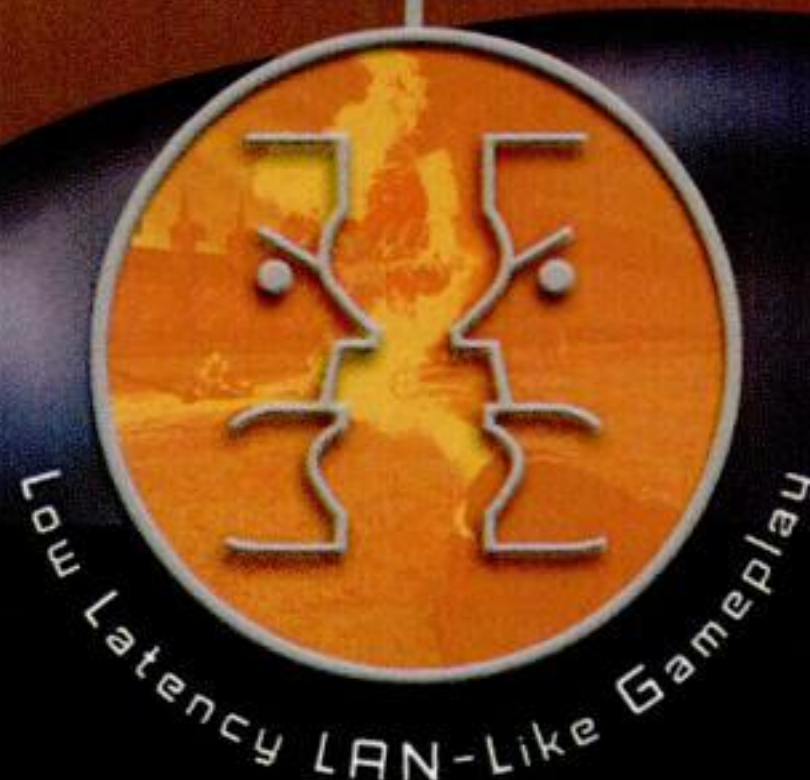
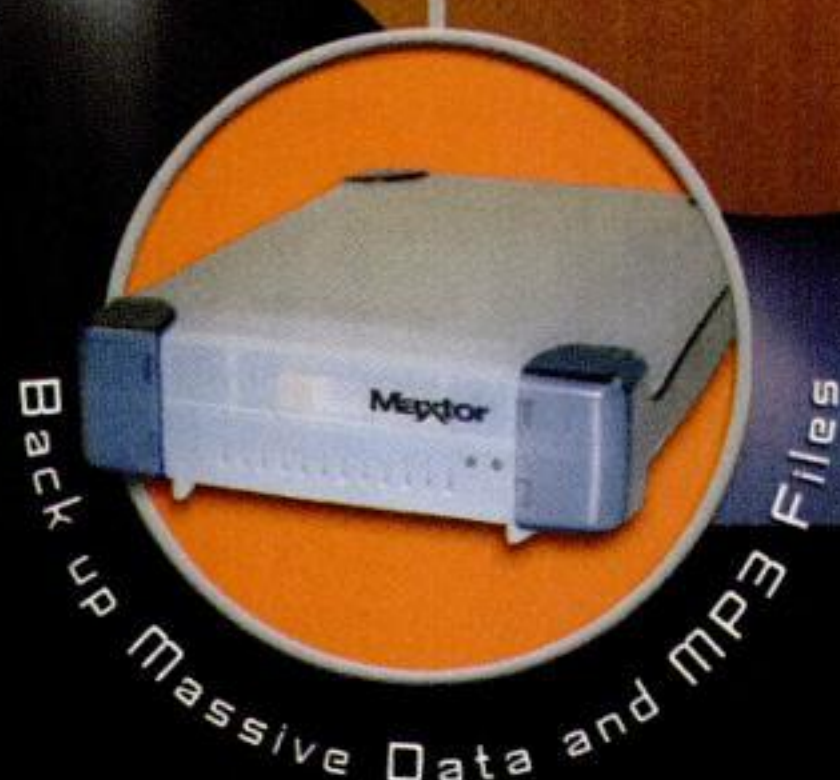
As with any cable connector, be especially careful when inserting the flat IDE cable into your hard drive or optical drive. If the cable doesn't have a safety tab that prevents it from being put in upside down, you can easily destroy a pin—or two or three or four—on your brand new 100GB hard drive.

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CREATIVE

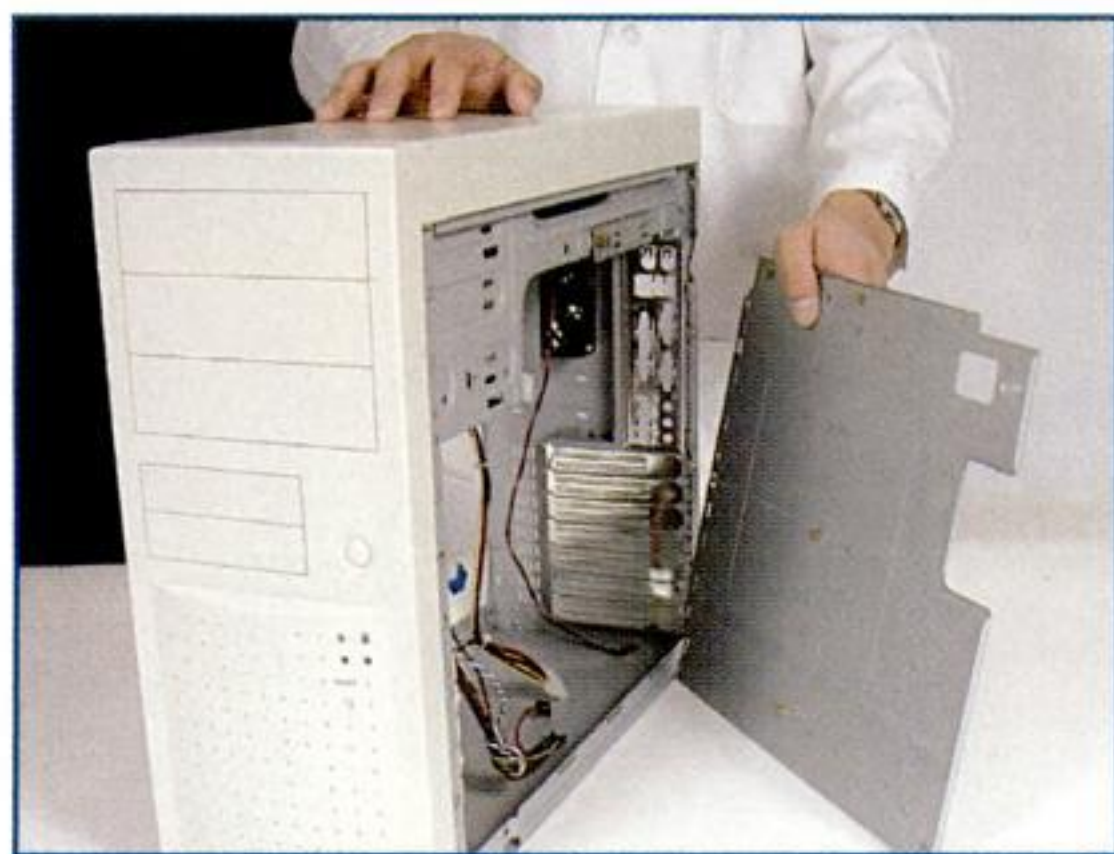
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Putting It All Together

Here's a step-by-step guide to putting all of your PC's pieces together. Although your components may differ from the ones we chose, the basic assembly is the same. Just remember to read this whole how-to before diving into the case.

1 Remove Mobo Tray

Using a case with a removable motherboard tray can make your assembly job much easier. Luckily, our mid-tower case from PC Power and Cooling has a removable tray. The case comes without a power supply, so we ordered the company's 300W Turbo-Cool supply. A good place to build



Fewer and fewer companies use removable motherboard trays these days. Fortunately, PC Power and Cooling's mid-tower case includes this amenity.

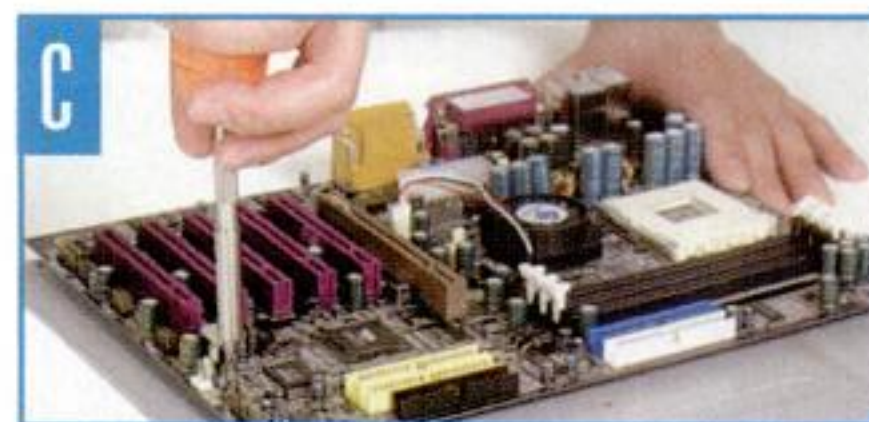
your project is in the kitchen, where there's plenty of light and no carpet to create static electricity. If you're in a particularly dry environment, and you're creating your own static discharge, consider getting an anti-static wrist strap from a local electronics store before you touch any items of value.

2 Mount the Motherboard

Begin by matching the mounting holes in the motherboard to the holes in the tray. Ideally, brass or aluminum standoffs should be used to support the motherboard in all four corners, as well as in the center. If your tray doesn't have a screw hole in a section of the motherboard that you'll be applying pressure to (such as near the IDE cables or PCI slots), then you can use plastic standoffs for additional structural integrity.

Make sure you can account for all the metal standoffs you've used. An errant metal standoff that's poking into a random point of the motherboard could potentially short out the PC. Also, be sure to firmly screw down any brass standoffs so they don't back off by accident. Once you've mounted the motherboard, you should push on different sections of it to make sure it feels solid.

Our Soyo motherboard uses a BIOS setup menu to configure most of the board's essential settings, but other motherboards may require that you switch physical jumpers to change settings. Now would be a good time to familiarize yourself with where these jumpers reside and what they do. For our motherboard, we did have to throw a jumper to instruct the onboard RAID controller to act as a normal ATA/100 controller for our single IDE drive.



(a) Make sure the I/O shield that came with your case or motherboard matches the I/O holes on the motherboard.

(b) Make sure the standoffs are tightened down so they don't back off.

(c) When screwing the motherboard into the backplate, leave it a little loose while you ensure that PCI cards will fit properly, then put the plate in.

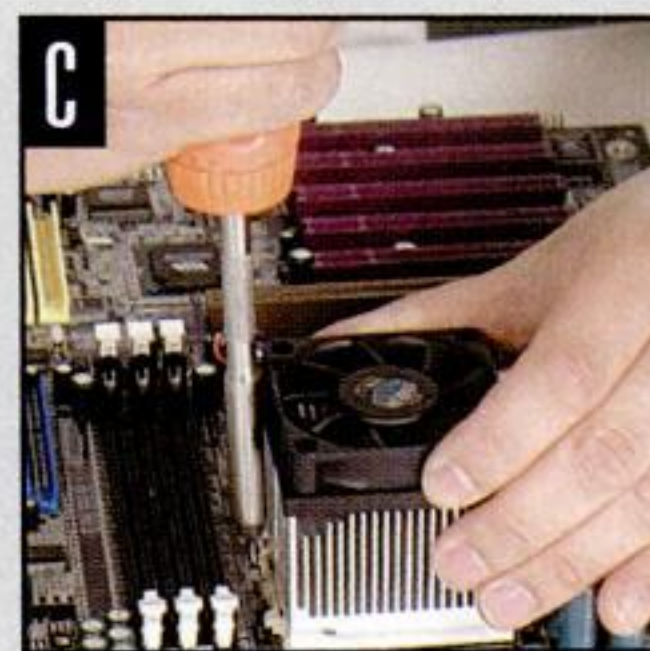
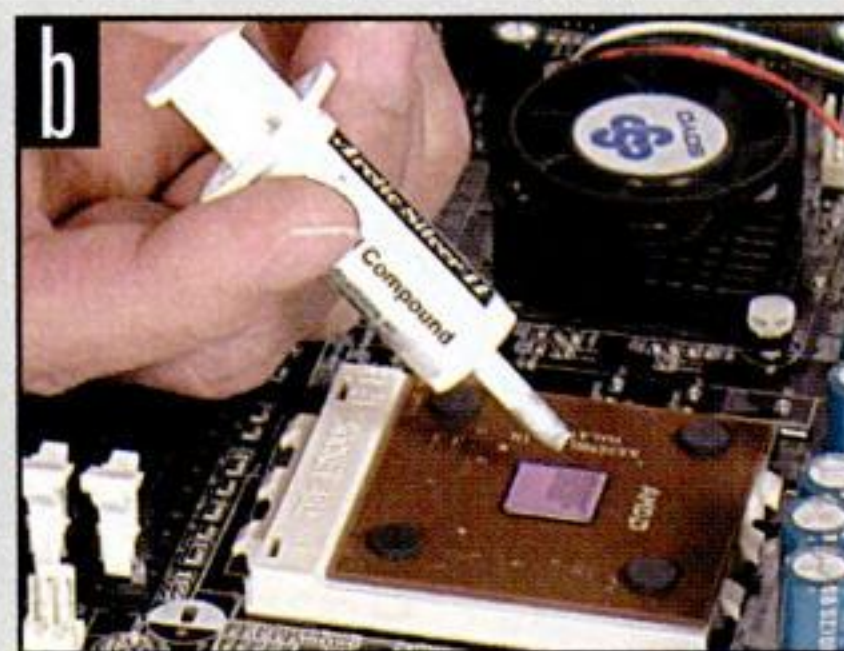
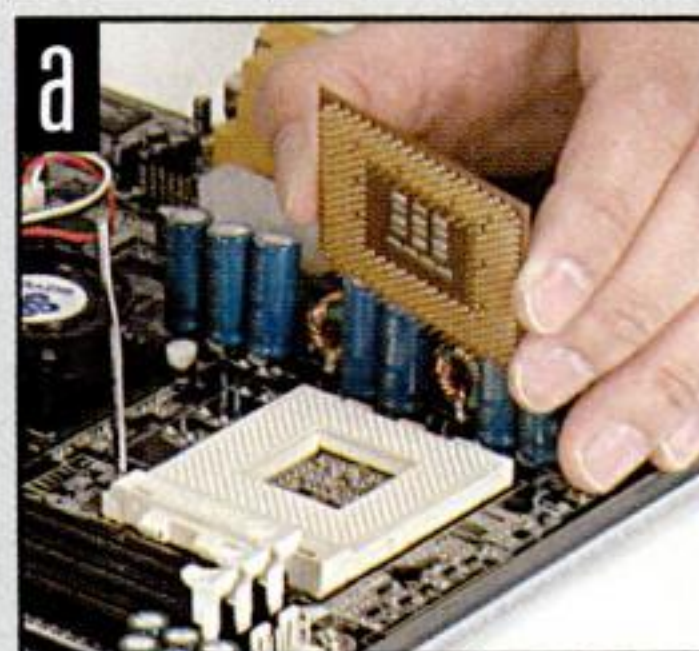
3 Install CPU

Modern CPUs are as delicate as butterflies. Don't manhandle them. To install a socketed CPU, lift the arm on the socket straight up in the open position. You'll notice that pins are missing from two corners of the Athlon XP (only one corner is missing pins on a Socket 478 Pentium 4). These notched corners should match the two notched corners of the socket. Drop the CPU straight into the socket, and take care not to bend any pins (see a). Once the CPU is sitting flat in the socket, lock the arm back down.

If you're sure your heatsink already has a thermal pad or thermal tape on

it, you don't need to apply thermal compound. Our heatsink came "raw," so we used Arctic Silver II thermal compound for its low electrical conductivity and good heat transfer characteristics. A tiny 1mm or 2mm dab of goop is generally good enough; apply it to the core (see b). Use enough to cover the core, but not so much that it oozes all over the CPU and motherboard. Obviously, you'll want to use more thermal compound for Pentium 4s with their larger cores. You can find more instructions at www.articsilver.com.

Mount the heatsink fan by placing the fan flat against the CPU. Clip one side of the heatsink to the socket. To clip the other side, use a screwdriver or needlenose pliers to nudge the other clip into place (see c). Press on only the clip and keep the heatsink flat on the CPU, not at an angle. BE VERY CAREFUL—it's ridiculously easy to crush AMD CPUs during heatsink application. While you're here, plug the fan into a nearby power header that's marked CPU1.



4

Accessorize the Mobo with Memory, Cables, and Wires

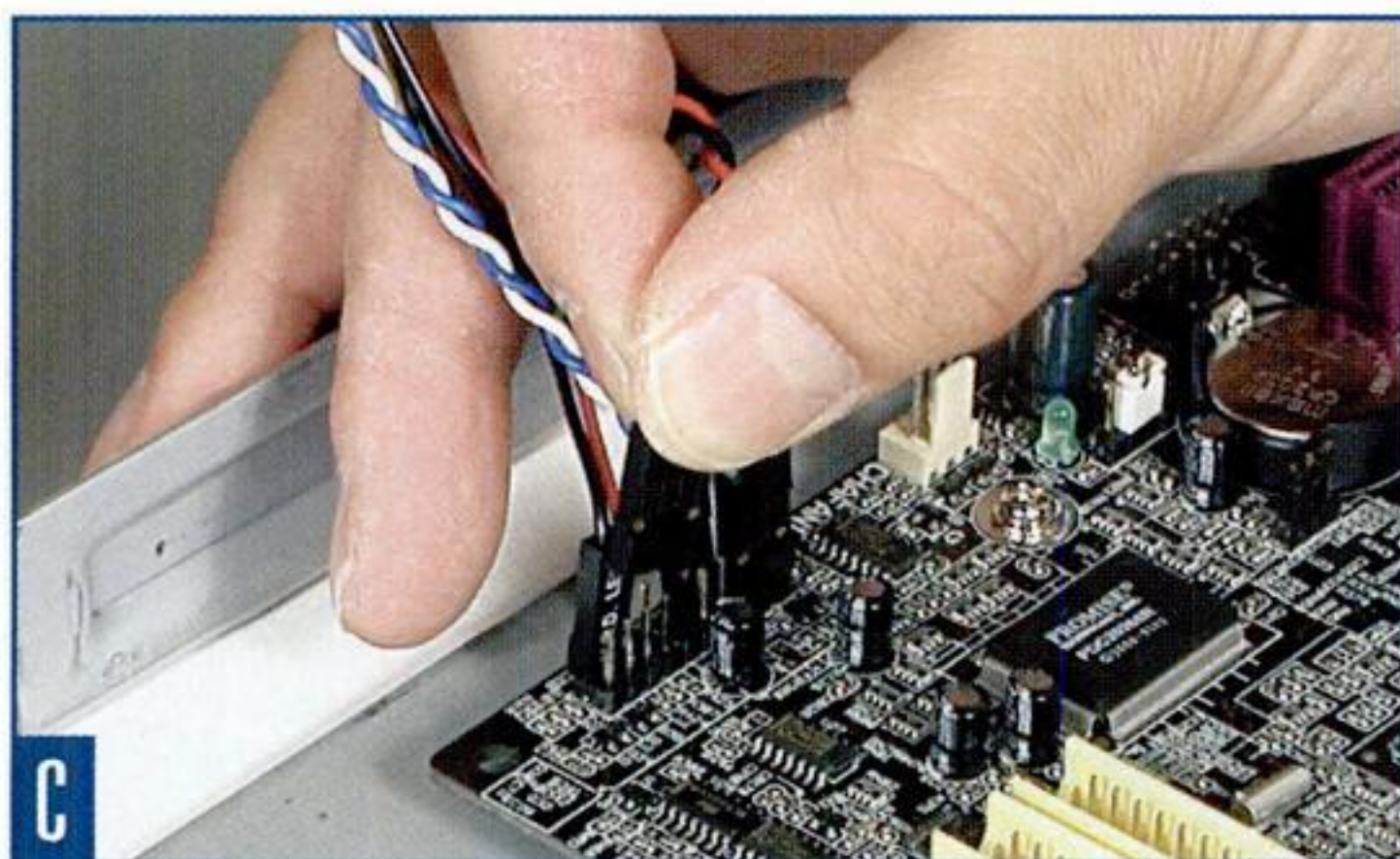
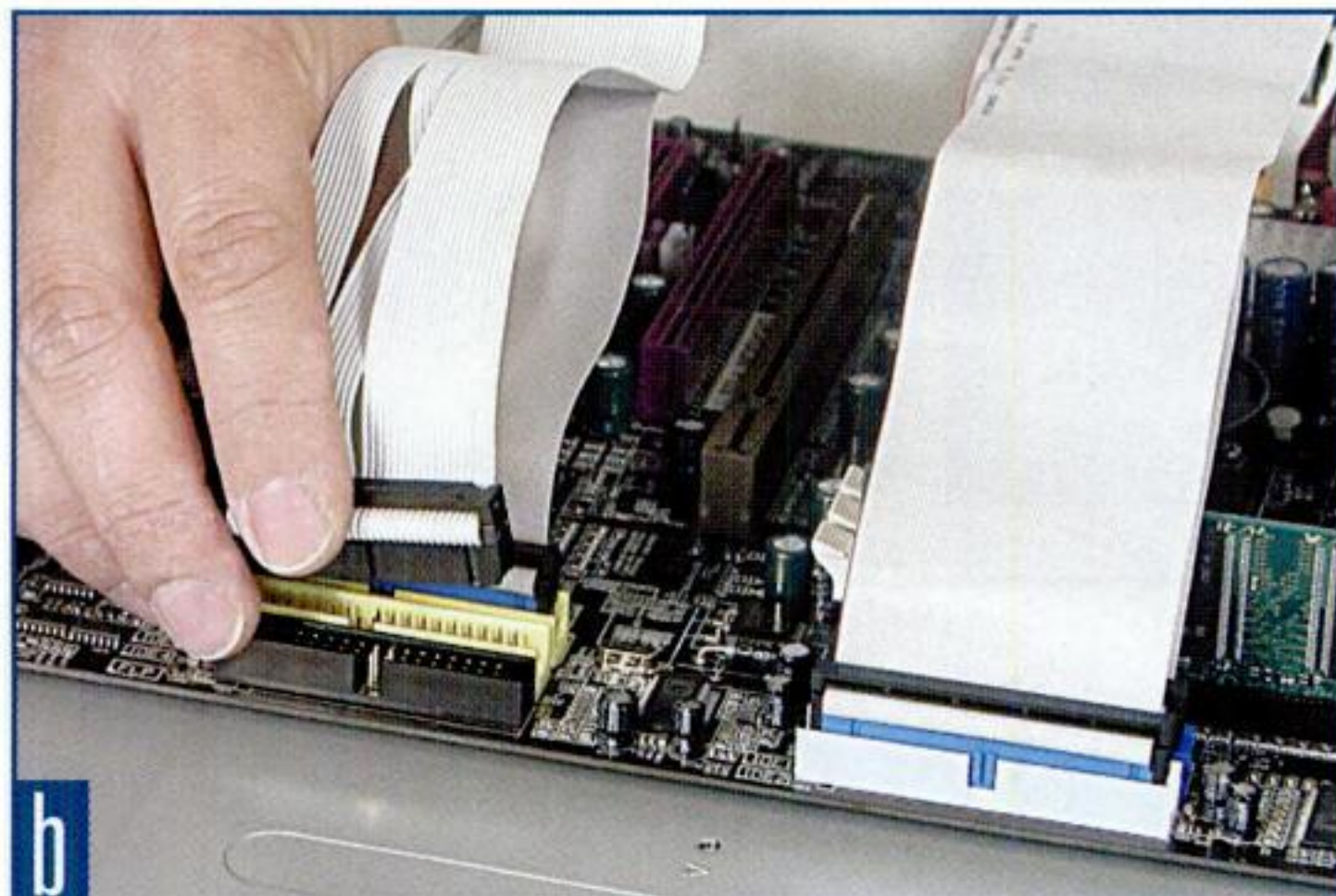
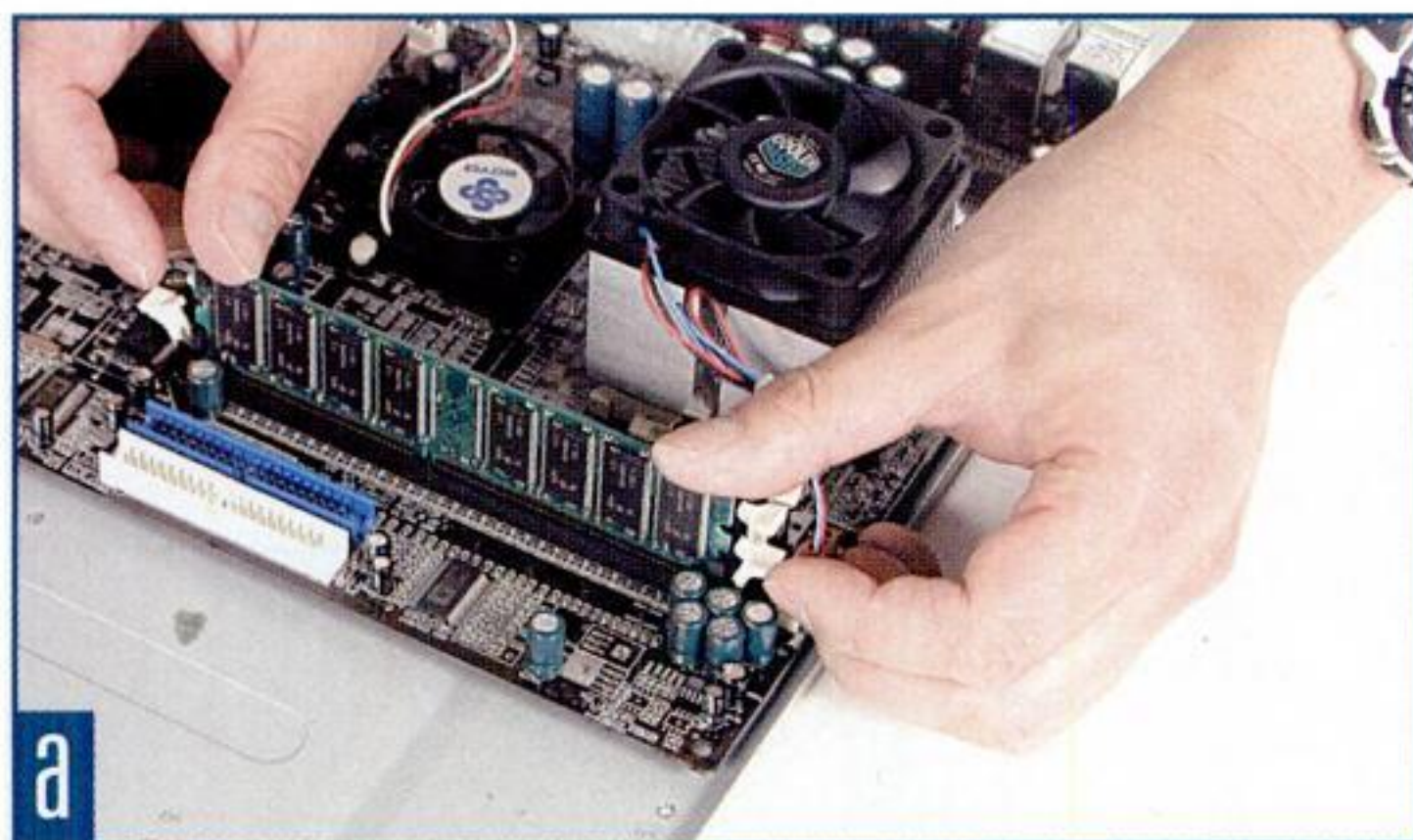
It's time to install RAM, cables, and the front-panel connectors. Open your motherboard manual and determine which memory slot should be populated first. Some motherboard makers actually

label the slots 1, 2, and 3. While your RAM may ostensibly work fine in any memory slot, using the correct slot can help ensure trouble-free performance. PC100 and PC133 memory modules boast two notches that make it easy to determine which way the memory fits into slots. But the DDR memory module that we used has only one notch, and it's nearly in the middle of the module, making it easy to inadvertently insert the memory in the wrong direction. Line up the notches and press the memory into the slot until it locks into place (see a).

Now insert the IDE cables. The cables should be notched to fit

in only one direction (see b). Use the fine-wired 80-pin conductor cables for your hard drives, and the coarse-wired 40-pin cables for your optical and removable storage drives. Try to keep the boot hard drive on the primary IDE channel, and try to keep optical drives on separate channels—high-speed CD burners won't perform at full spec if they're pulling data from a CD-ROM drive that's sitting on the same channel. In our case, we actually isolated all of our IDE drives on their own channels by using the Soyo's two regular IDE channels, as well as the two extra IDE channels enabled by the motherboard's onboard IDE RAID controller. (Unless your system is equipped with an IDE RAID controller, you'll only have two IDE channels total.)

Finally, carefully examine the motherboard and its manual to determine which way to connect the power-on, reset, and hard-disk activity lights located on your PC's front panel (see c). If you put the connectors in backward, you won't kill anything, but the lights won't work.

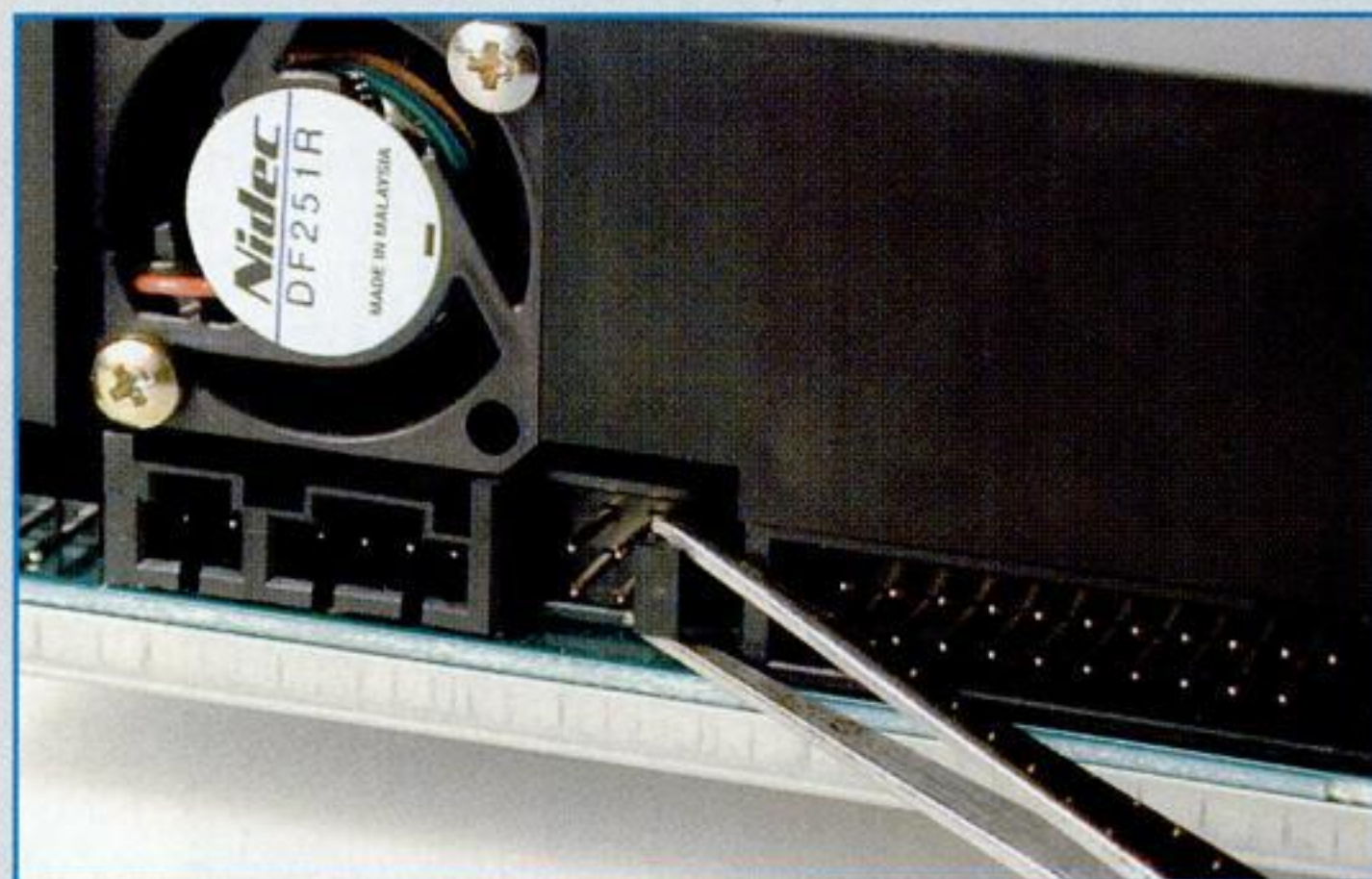


- (a) Before you rush out and buy the largest chunk of memory you can find, make sure the memory type is supported by your motherboard. You should also verify which slot to use if you're populating your board with only one stick of memory.
- (b) Most motherboards come with their own IDE cables. Usually, the blue connector goes on the motherboard.
- (c) No one ever connects the front panel connectors correctly the first time. If your new PC won't boot at first, make sure your power switch connector has been inserted properly.

5 Set IDE Master/Slave Jumpers

This step is for everyone who doesn't have access to four IDE channels and might need to put two IDE devices on a single channel.

Let's say you have three IDE drives: one hard drive, one DVD-ROM drive, and one CD-RW drive. Because each IDE channel supports two devices, you can accommodate all your drives—but you'll need to set each drive in the proper position. You'll want to plug the hard drive into the master interface of the primary IDE channel; the DVD-ROM drive into the slave interface of the primary channel; and the CD-RW drive into the master interface of the secondary channel. Now for the kicker: Each IDE device must be appropriately set as either a master or slave device. You can do this by setting a jumper on the back of each drive; a little map next to the jumpers will indicate proper settings. To ensure reliable operation, we recommend that you eschew the "cable select" option and instead opt for either a master or slave setting.



The jumpers on the back of an IDE drive usually let you choose master, slave, or cable select. Move the jumper around to change the relationship.

6 Slap in the Drives

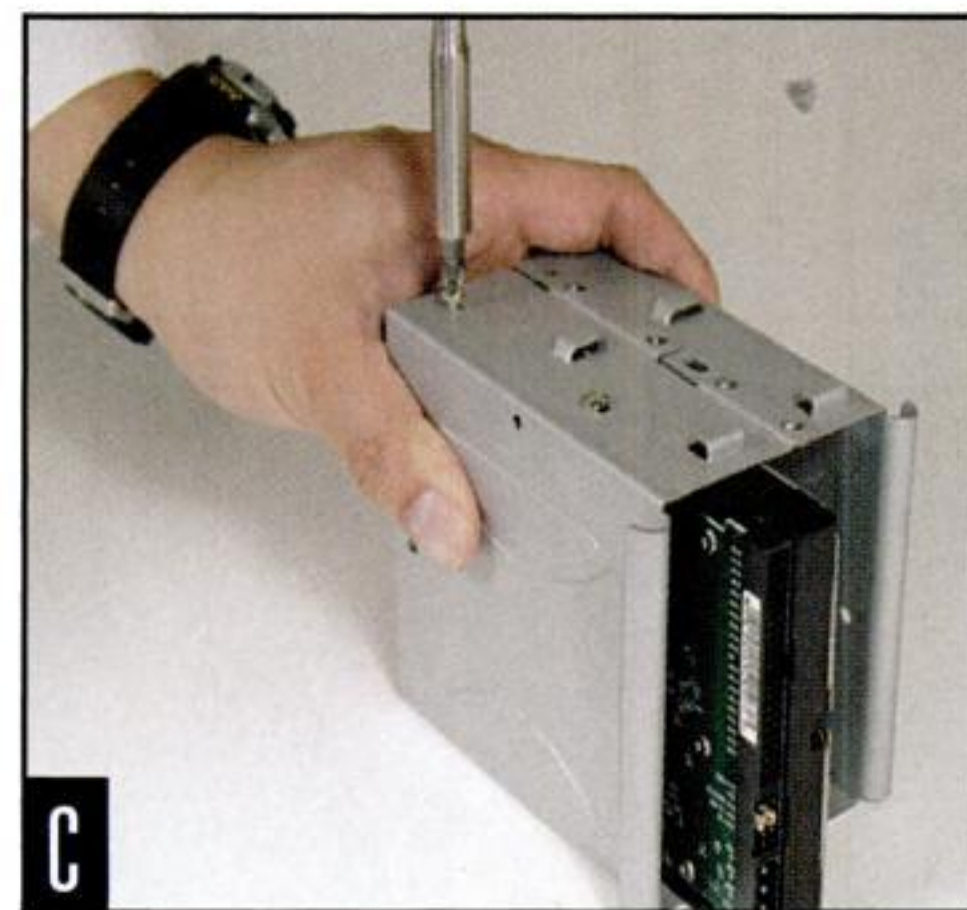
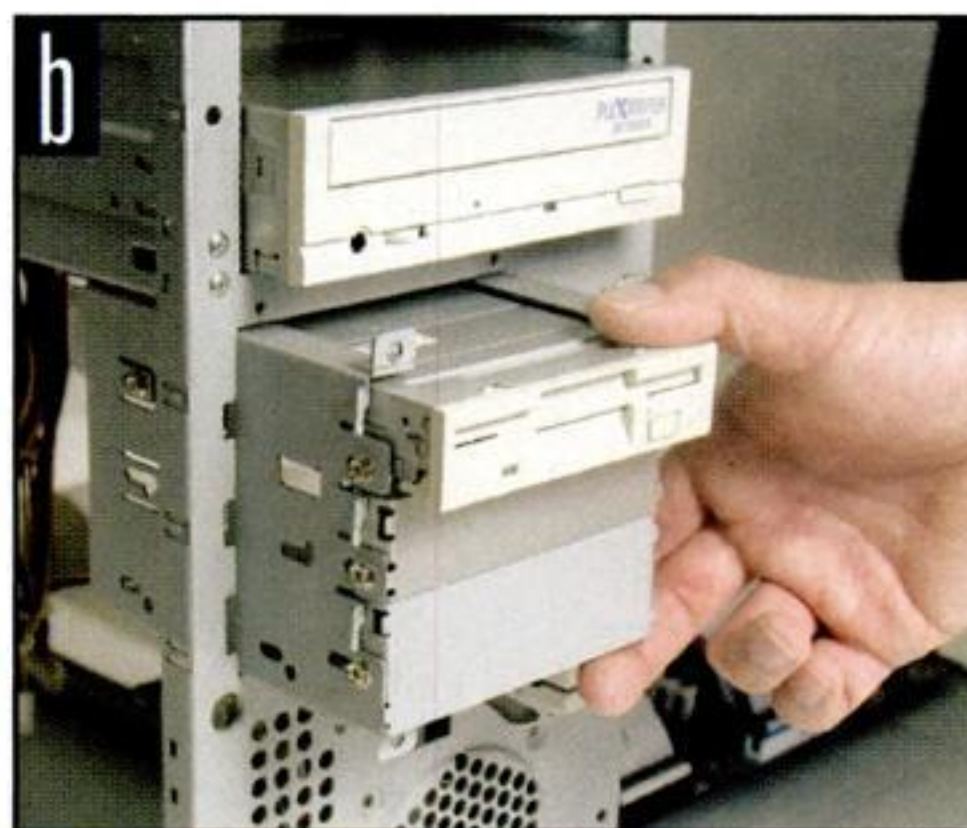
We staggered our CD-RW drive and DVD-ROM drive in order to keep an empty drive bay between the devices. Stacking optical drives on top of each other usually won't hurt anything, but it makes sense to encourage as much airflow as possible inside your case. Because our mid-tower case is intended to sit on the floor, and because our DVD-ROM drive will be used to play DVD movies and audio CDs, we

placed the DVD-ROM drive in the top bay for convenience. We have a small case, so we weren't worried about the length of our IDE cables. But if you're using a relatively tall case, remember to get extended IDE and floppy cables.

When actually screwing your drives into the case, we recommend that you do so on both sides of the drive—this will require removing the starboard-side case cover. Today's optical drives spin at

increasingly high speeds, and excessive vibration or rattling can actually hurt performance, so you'll want your drives properly secured to your chassis. We recommend that you use a non-magnetized screwdriver for this type of work.

Go ahead and mount your optical drives and floppy drive, and pop in the front case bezel if it's been removed. Since both sides of your case are open at this point, take the time to align the floppy and optical drives so they sit flush with the front case bezel. If you have a hard drive gondola like the one that came with our case, screw your hard drive into it. Just don't insert the gondola back into the case; we'll get to that later.



(a) We put the PlexWriter CD-RW drive on the bottom and the Pioneer DVD-ROM drive on top because we'll want quicker access to the DVD-ROM drive—but that's just us. (b) The floppy drive is like the PC's appendix—but we kept it in our project for sentimental reasons. (c) It's important to tightly fasten screws on both sides of your IDE drives, such as this 7,200rpm hard drive. Excessive rattling may hurt the performance.

7 Put the Motherboard in the Case

It's now time to fit the whole motherboard enchilada into the case—but before you do so, make sure the holes in your case's metal I/O shield match the I/O ports on your motherboard. Also, make sure all the shield's metal holes are punched out. If the holes don't match the ports, don't proceed! Get a proper I/O shield to save yourself heartbreak down the line. When you install the motherboard tray into the PC, make sure you don't crimp any cables. We

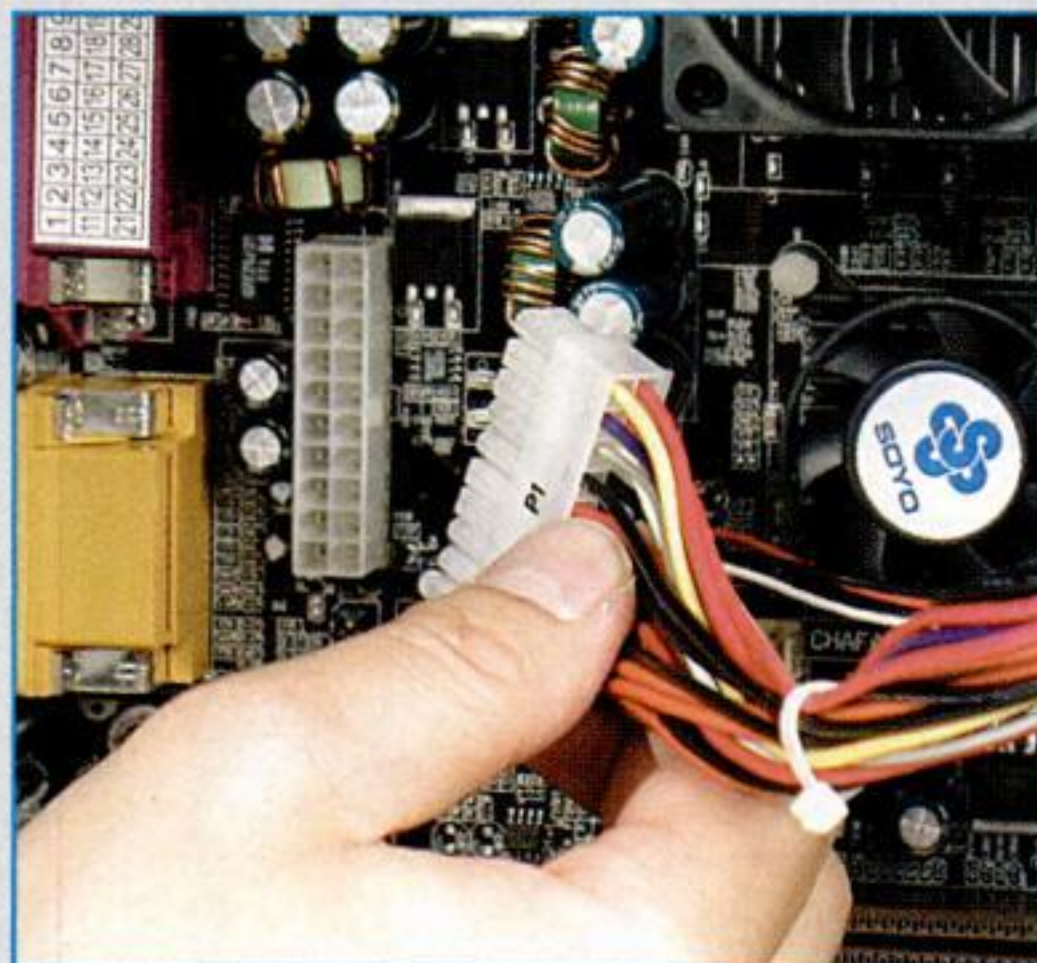
usually leave the motherboard screws a tiny bit loose and tighten them only after we're sure there's enough space between the back of our PCI add-in cards and the edge of the motherboard.



Fold in the motherboard tray carefully, and check to see if the case's I/O shield matches your motherboard I/O ports.

8 Connect the Power

Match the clip of the 20-pin power connector with the notch in the plug, and firmly clip it in place. Like most desktop Athlon mobos, our Soyo needs just the 20-pin for power. Motherboards for the Pentium 4 add a small 4-pin connector (labeled 12V) for additional 12-volt power needed by the CPU. So, if you're building a Pentium 4, attach that connector as well. For all power connections, check your motherboard manual for anomalies. Some boards, such as the original Athlon MP mobos, use proprietary plugs. Many dual Athlon boards also make use of the 12V connector, and may require that you plug a hard drive power plug directly from the power supply into the motherboard.



Make sure you plug the ATX power connector to the motherboard in the correct direction. The power plug will usually include a notch that prohibits improper insertion. An incorrectly inserted power plug will kill your PC.

9

Hook up Drives

It's now time to connect your IDE cables to your optical drives. The cables are notched and should fit only one way into the drives and motherboard.

If your case is so cramped that you can't see where the notch is, remember that the red stripe on the IDE cable corresponds with pin 1 on an IDE drive, and pin 1 is the pin closest to the drive's power connector.

After you've hooked up the IDE cables, insert the four-pin power cables to the optical drives. The power cables are keyed so they'll fit in only one way, but we've seen worn-out and cheap power cables that magically fit in the wrong direction. The short lesson is to make sure you have your power plugs facing the right direction.



(a) First goes the IDE cable.... (b) Then goes the power connector. For both insertions, be gentle and make sure everything is facing the correct direction.

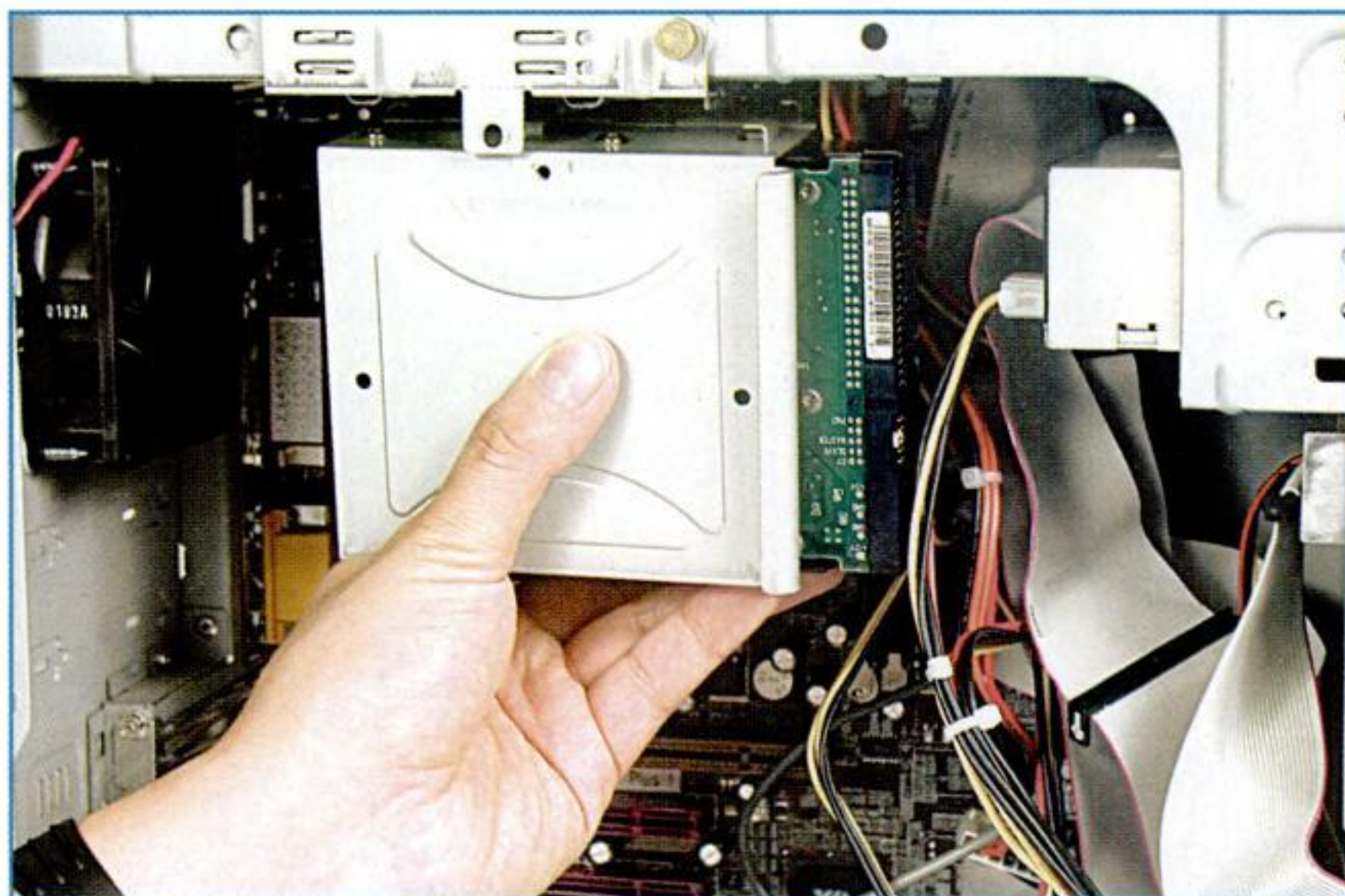
10

Hooking up the Hard Drive

In our PC Power and Cooling mid-tower, we used the included hard drive gondola to mount our hard drive. While the gondola design restricts the use of tall fans and heatsinks, it does aid in cooling the 7200rpm hard drive—because the gondola is more or less suspended in the middle of nowhere, air gets to flow all around it.

If you're not using a gondola, just screw the hard drive into an available 3.5-inch drive bay and remember to leave open space for cooling. Once we screwed our gondola back

into its original position, we hooked up our IDE and power cables, just as we did with our optical drives. Your CD-ROM drive probably doesn't need the dense 80-conductor cables, but all ATA/66 and ATA/100 hard drives do. You can tell the difference between 80- and 40-conductor cables by looking at their wires. 80-conductor cables use very fine wires; 40-conductor cables use relatively thick wires. Because we have four independent IDE channels available, we set the hard drive to master and plugged it into the master interface of the primary IDE controller.



The gondola in our PC Power and Cooling case provides our 7200rpm hard drive with a slightly cooler environment than a drive bay would.

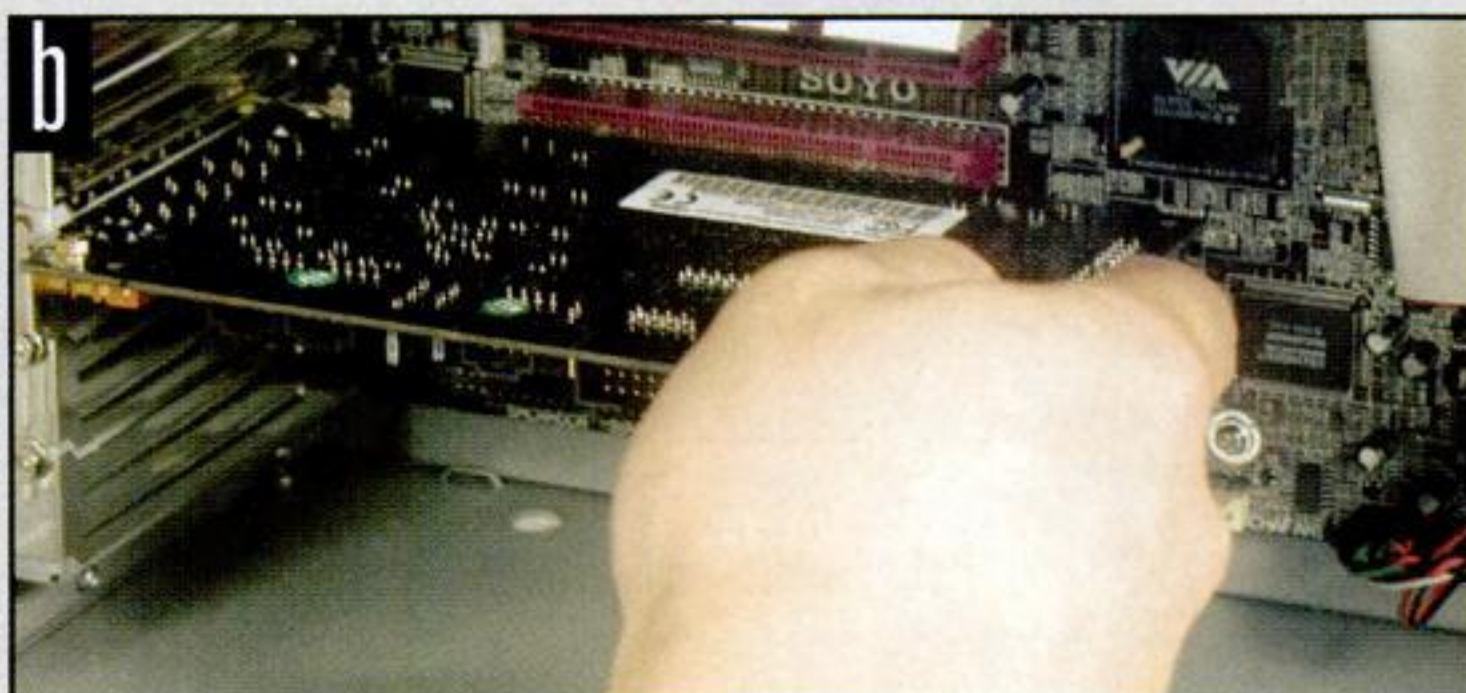
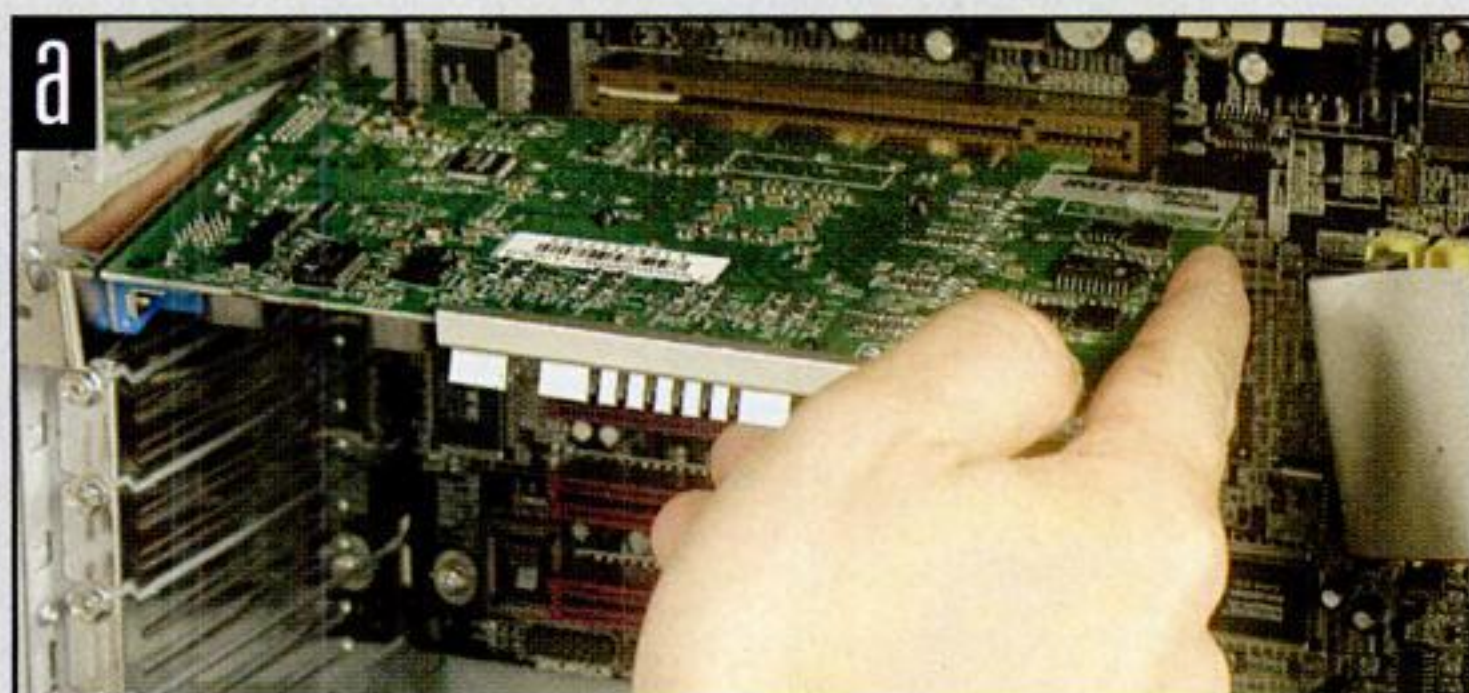
11

Adding the Videocard and the Soundcard

The first add-in card we installed was the Leadtek GeForce3 AGP card. The Soyo Dragon, like many Athlon motherboards, features the slightly longer AGP Pro slot to accommodate cards that need to draw extra power. Our GeForce3 card, however, is a normal AGP card (a). Both the card and slot are keyed so it's near impossible to screw up the insertion of the card—but we have heard of people jamming the card into the wrong slot and frying their systems. If your motherboard has a sticker or small piece of plastic that plugs up part of the slot, leave it in place; this will prevent the card from shifting backward and shorting out.

Back in the day, we would have recommended that you boot up your system and verify its health before installing your PCI cards. But because we have so much confidence in today's hardware, we went ahead and also installed a Creative Labs Sound Blaster Audigy soundcard. Because videocards generate so much heat, we placed the Sound Blaster in an open slot away from the AGP card (b).

We're not going to tidy up our wiring until we've "burned in" the PC for a 72-hour period. In fact, you should never, ever, ever put the side back on your case before you boot up. If you do, your PC will refuse to boot just to spite you.



12 Setting Up the BIOS

We've gotten this far without detecting the acrid smell of charred silicon—so far, so good. Now it's time to set up

your PC's BIOS. The term BIOS stands for "basic input/output system." This is the software that contains all the rudimentary instructions on how your

operating system should communicate with your hardware.

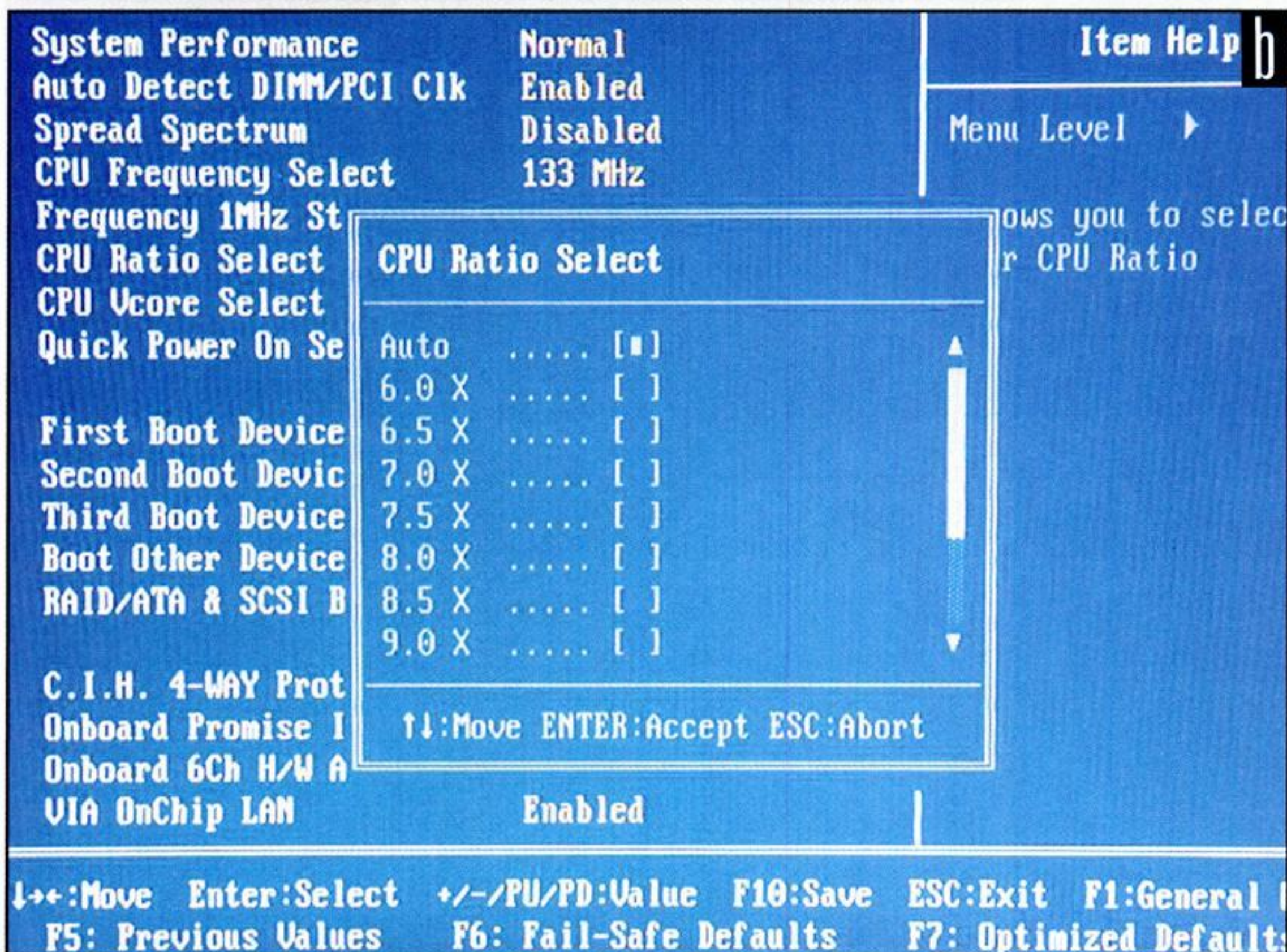
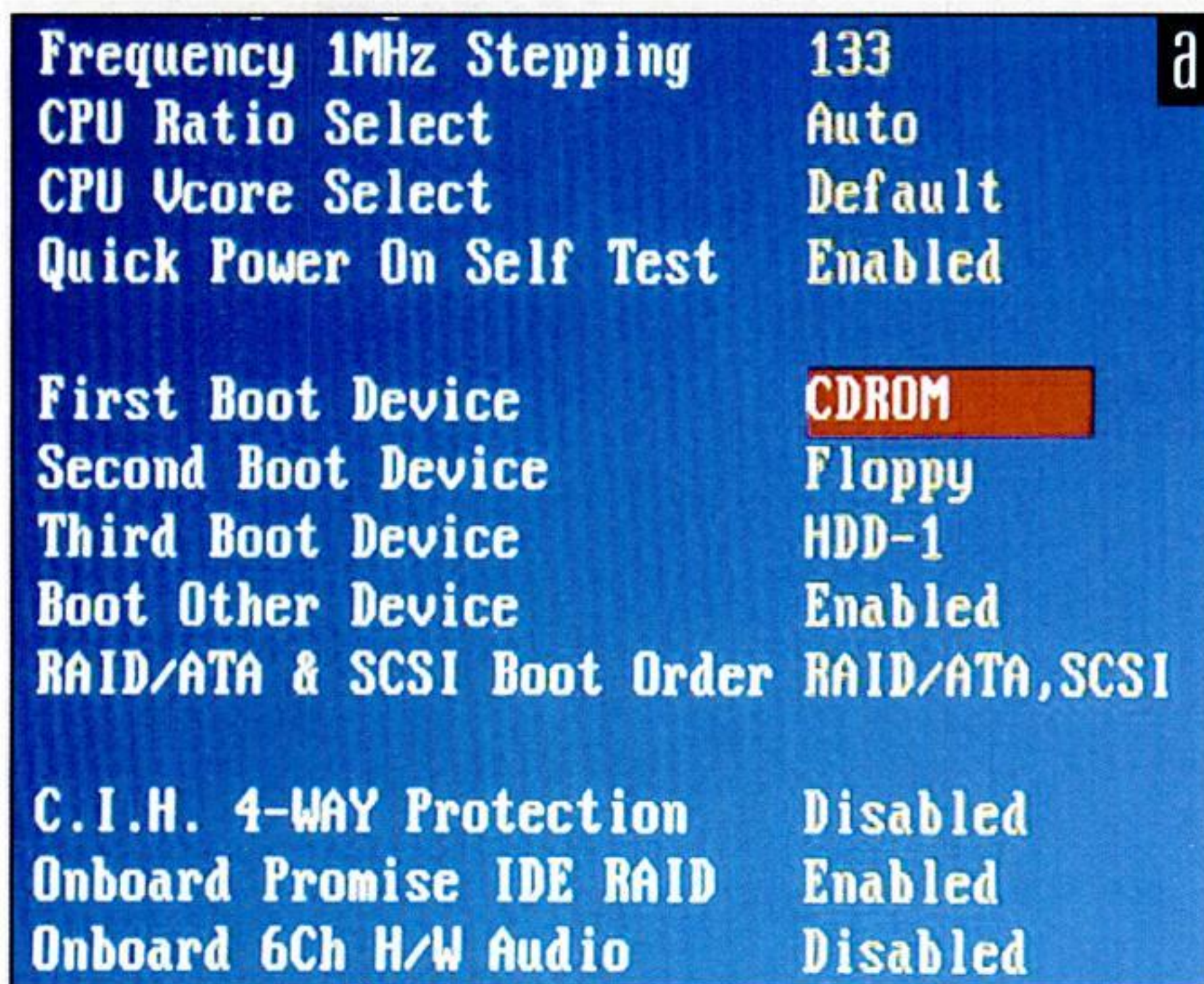
First, turn on your newly constructed PC and punch the key that lets you enter the BIOS. It's normally the F1, F2, or DEL key. If you get a full-screen logo but no key prompt to "enter setup," hit the ESC key. This will spawn your hidden boot sequence. Now you can hit F1, F2, or DEL to enter the BIOS setup screen. Once you're inside the setup menus, you can adjust a number of parameters that will affect OS-hardware communication. But for the purpose of this tutorial, we'll just focus on a few necessities:

■ Because you'll soon be loading Windows XP Home from scratch, directly off its CD, the first thing you'll want to do in the BIOS is set the first boot device to the CD-ROM drive (see a). This tells the computer to boot from the CD drive before trying to boot from the hard drive, which is still blank. While you're in the BIOS, you'll also want to disable the onboard audio to make way for the Sound Blaster Audigy card.

■ Make sure your system bus is clocked correctly. For AMD systems, like ours, this means a setting of either 100MHz or 133MHz, depending on the CPU you have—100MHz for Duron and 133MHz

for Athlon XP. Remember that you can't manually set the CPU multiplier (or ratio) for Athlon XP or any Intel processors, so leave the BIOS setting at "auto" (see b). If at any place in the BIOS you encounter options for "Maximum" or "Normal," go with the Normal setting—you want to make sure everything is working fine before you try to optimize for maximum performance.

■ Check the System Health or Status tab for details on your CPU temperature and CPU fan speed. Our 1.53GHz Athlon XP was running at a mere 111 degrees Fahrenheit, and the fan was turning at about 5500rpm—all within spec.



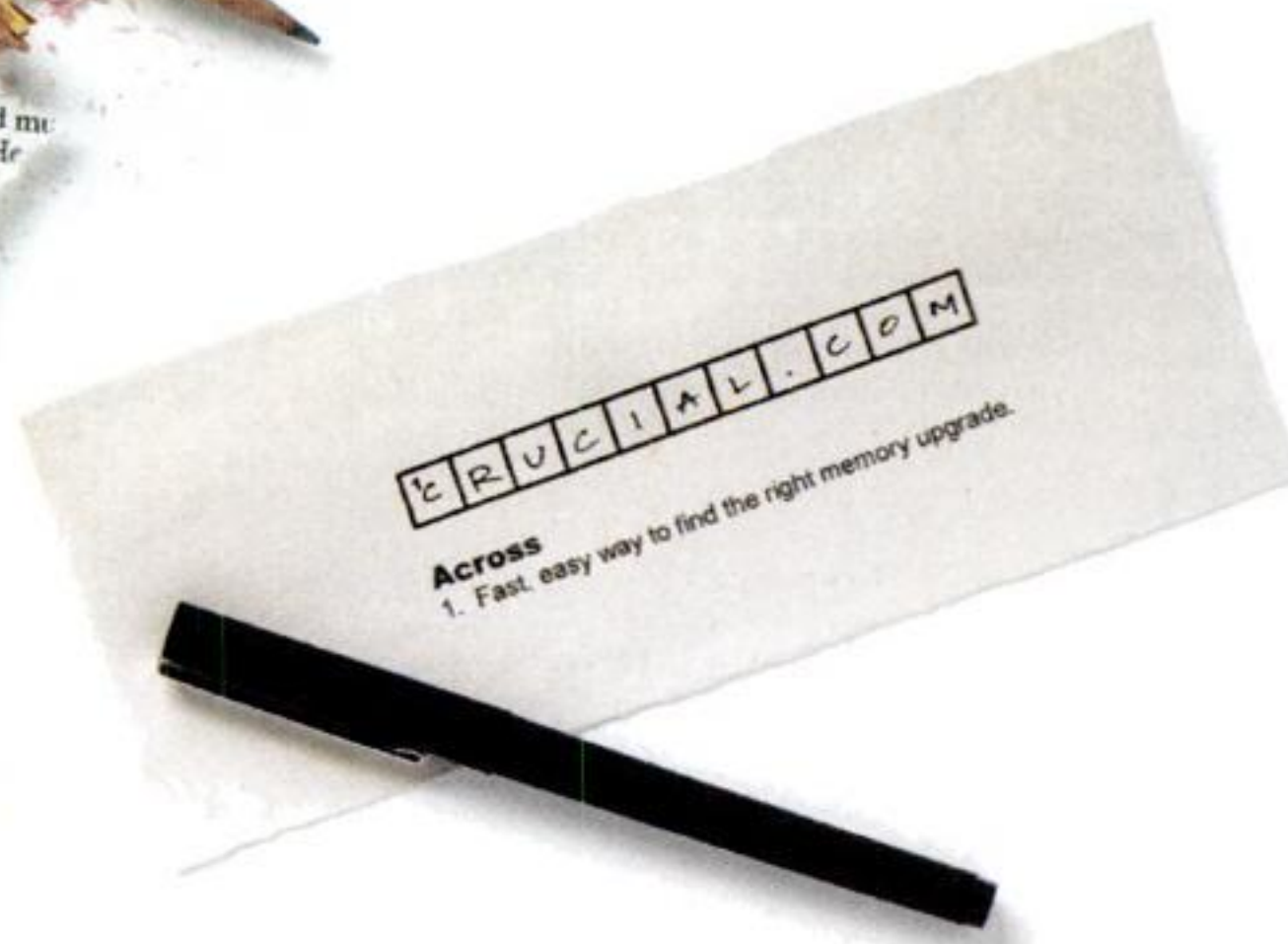
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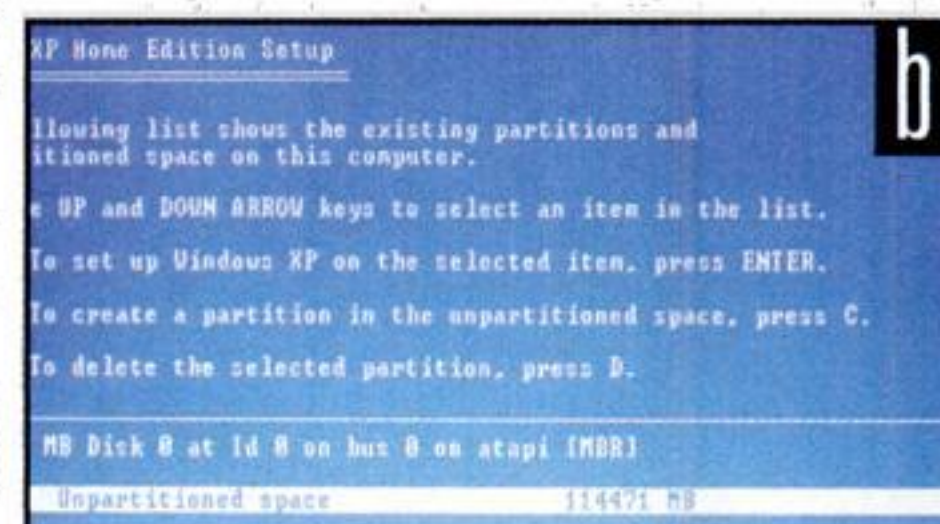
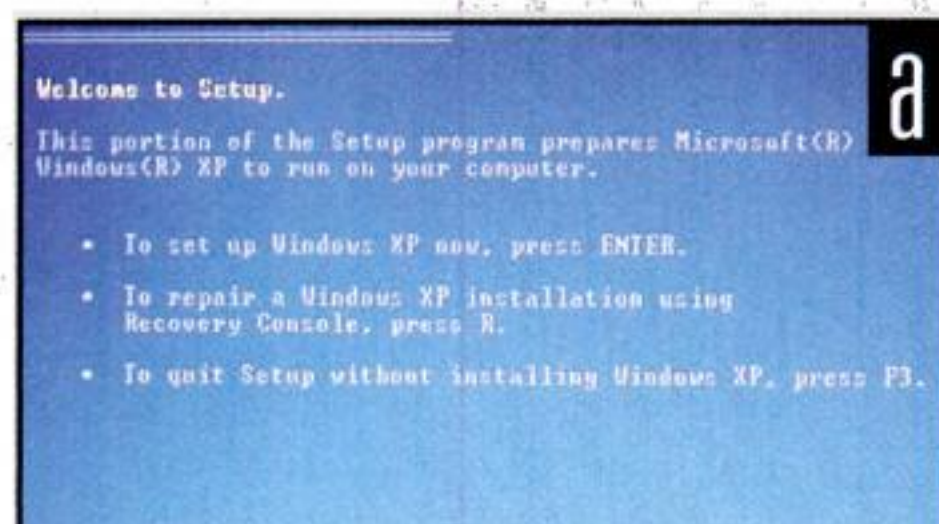
13 Installing Windows XP Home

We're in the final stretch, and lucky you, the Windows XP setup routine is much easier than that of earlier versions of Windows.

After you've finished with our BIOS guide, your system should be set to boot from the CD, so insert your WinXP disk and reboot your computer. You should eventually see a screen prompting you to "Press any key to boot from CD," at which point you'll need to press the "any" key.

Before the GUI

After your system has booted off the CD, the installer will start the non-GUI portion of setup ("GUI" stands for "graphical user interface"). If you want to install Windows on a SCSI drive or RAID array that XP doesn't include built-in drivers for, you'll need to press F6 as soon as you see the blue screen. Otherwise, you can patiently wait for the screen



shown in (a).

Follow the prompts until you get to the partitioning screen shown in (b). Assuming you're using a new hard drive, you'll need to tell Windows how you want to configure your disk. If you're using your old drive, be extra careful at this step—this part of the installer is the WinXP equivalent of FDISK and can easily wipe your drive. For maximum performance

with XP, we recommend creating one big partition that spans the entire drive. If you decide you need two partitions later, it's easy to repartition the drive using a utility like *Partition Magic*. Unless you plan on dual-booting Win98 or WinME, we recommend that you use the NTFS format for your new drive. And *always* do a thorough format on a brand new hard drive!

Once you've started the format, it's usually safe to leave the machine for 20 or 30 minutes. The formatting process is even more mind-bogglingly dull than watching paint dry.

Halfway there!

When you return, your PC should be into the GUI stage of the install. The first screen you'll see is the language options screen (c). Unless you have a non-standard keyboard layout, or don't live in the U.S., you can safely continue to the next step.

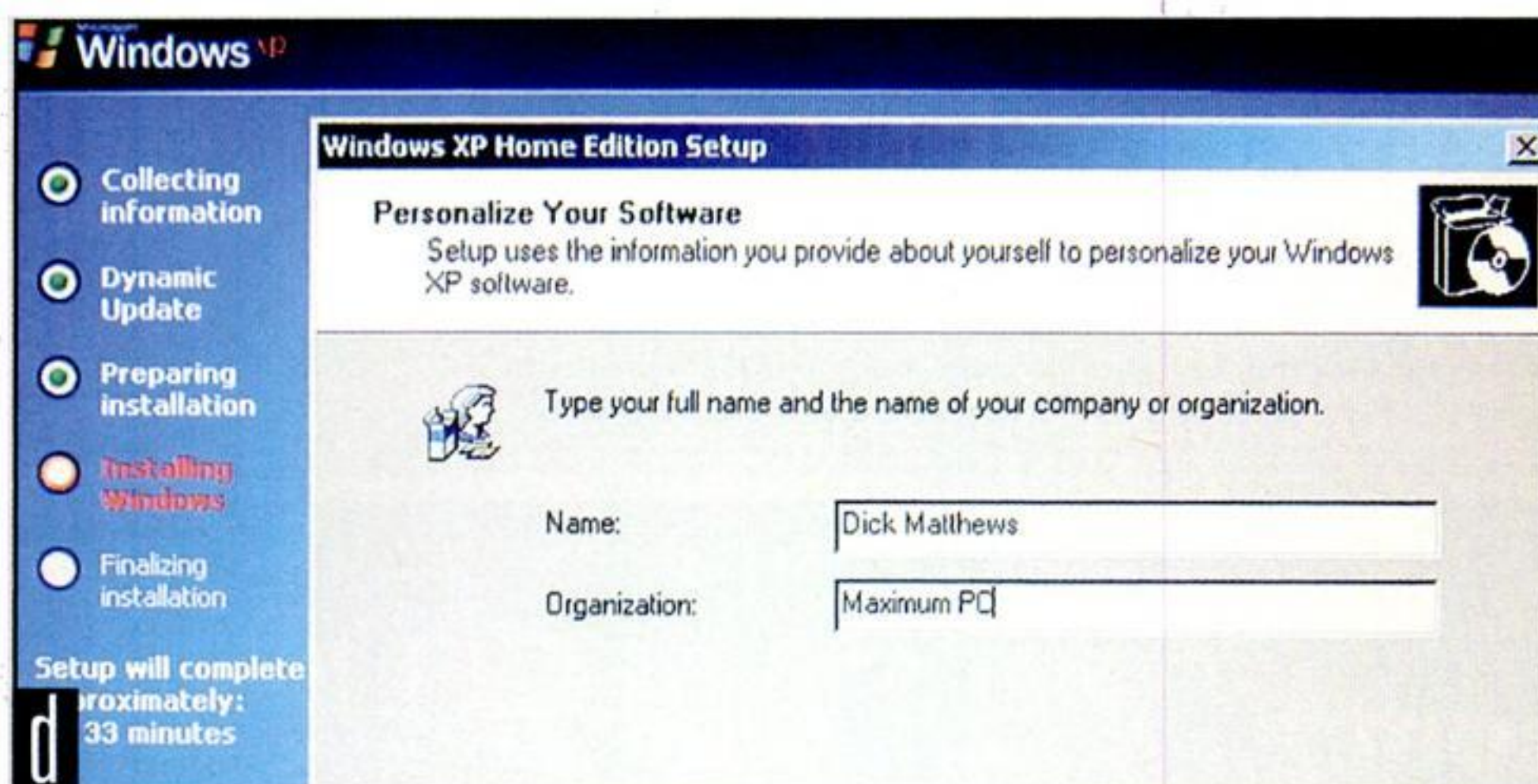
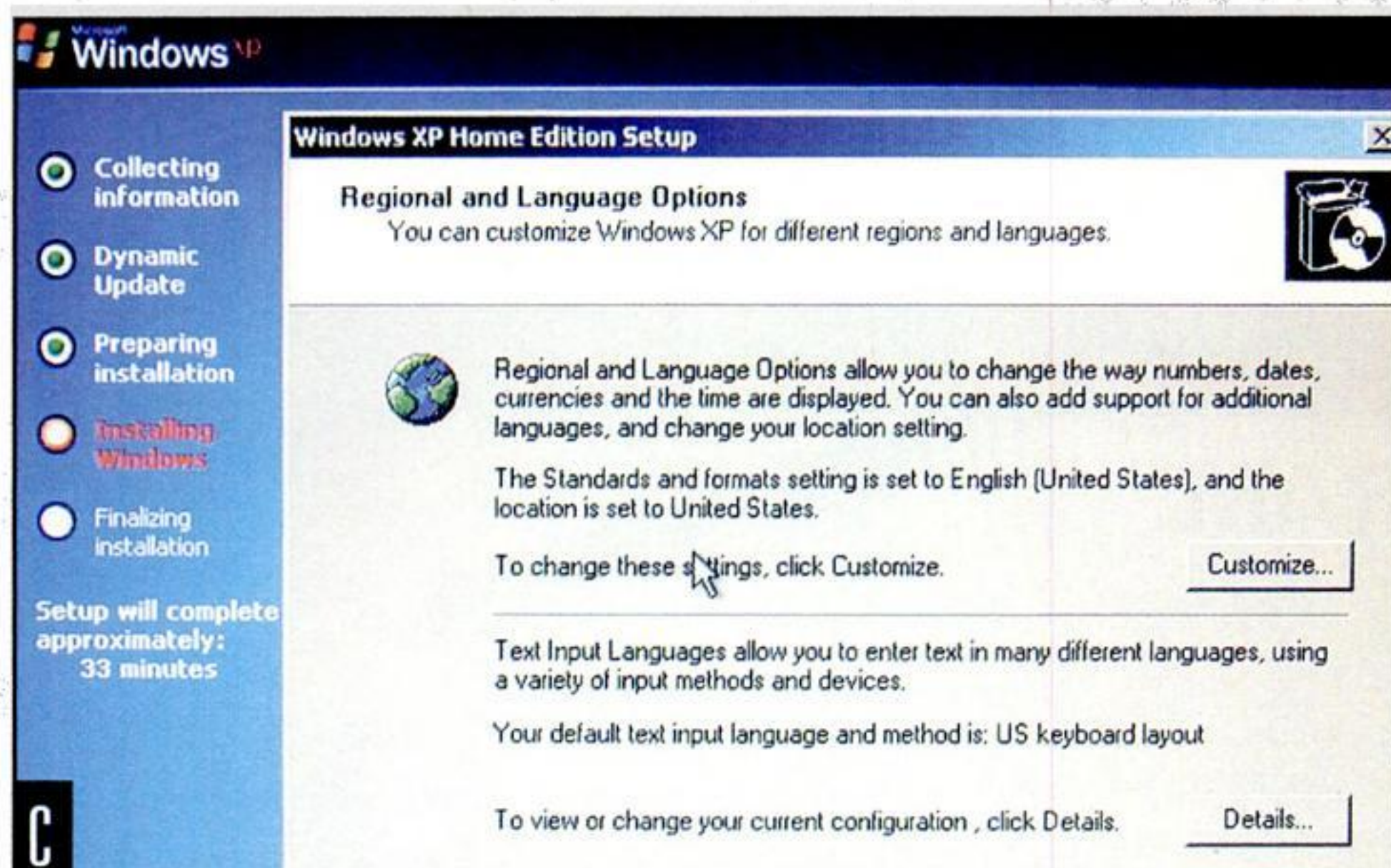
Next, you'll need to enter your name (d). Since we're giving this machine to Dick Matthews for the services he's rendered, we used his name.

The last real step you have to wade through is the setup of your network. Typical settings work for most cable modems and DSL connections, although you'll need to use manual settings if you have a statically assigned IP address or use some sort of wonky PPPoE connection. After the network is configured, Windows should reboot one last time.

Finishing up

After the final reboot, you'll be prompted to activate Windows. We recommend that you hold off until you've gotten all the drivers set up for your hardware and everything is working properly. You should have at least 30 days before your unactivated copy of Windows stops working, so take your time.

Now that WinXP is installed, hit the web and grab the latest drivers for your motherboard, 3D accelerator, soundcard, and anything else that might need an update (always install new motherboard drivers first). Finally, have fun with your new system!



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10 Troubleshooting Tips You Can't Do Without

So you followed all of our instructions, and your PC doesn't boot properly? Before you cry bloody murder, make sure you follow these 10 tips. If your machine is still broken after following these suggestions—and you've already done your own online research and have contacted the appropriate customer service channels—

e-mail the details of your problem to doctor@maximumpc.com under the subject line "BUILD IT GLITCH." The Doctor will do his best to help, but please understand that it's very difficult to troubleshoot a machine via e-mail (and phone and house calls are out of the question).

Can't see the optical

If you can't seem to boot off the Windows XP disc in the CD-ROM drive, double-check the boot sequence in the BIOS. Ensure that it boots to the CD-ROM before the hard drive. After you've finished installing WinXP, you can leave the CD-ROM at the start of the boot sequence or, to save a little time during startup, put the hard drive back as the initial bootup device.

Bad motivator

Your motherboard will likely issue "POST errors" if one of your components is broken, improperly seated, or improperly configured (any of these problems could keep your machine from booting). The errors typically sound like a series of R2D2-like beeps. The specific beep sequence will indicate the nature of your problem. Consult your motherboard manual for a guide to POST errors.

Sound off

If the system doesn't emit any beeps whatsoever when you turn it on, make sure you have your case speaker connected to the motherboard; you'll want to hear any error messages that the system might be issuing. Please note that some motherboards come with their own onboard speakers, precluding the need to connect a case speaker.

Exile the riff-raff

It's always possible that you were sold a bum part, or that you're using a fully functioning part that's saddled with broken drivers. To determine if this is the problem, follow this most basic of troubleshooting methods: Remove a suspect driver and replace it with an updated one, or remove a suspect part and replace it with a part that you know is healthy. Through a process of elimination, you can effectively isolate the driver or subsystem that's giving you trouble. More likely than not, the problem lies in your add-in cards and their drivers.

Drive on the left side

PC power supplies support both the 115-volt power used in the U.S. and the 230-volt power used in other parts of the globe. Most power supplies are already set to 115, but we have seen them set to 230 before. Make sure your supply is set properly before you fire it up. This problem is rare, but when it happens, it stumps even the pros.

Hot flashes

If your system starts up, then reboots after a few seconds, you likely have an overheating problem. You may have too fast a CPU for your heatsink, or you may have forgotten to install the thermal pad or thermal compound between the CPU and heatsink. If you have indeed applied the pad or compound properly, check your case for proper airflow and consider increased cooling paraphernalia (see page 42 for details). You might also make sure your CPU is clocked within its proper spec range.

Lights on

If the floppy drive refuses to work and the access light stays lit, then the cable was attached incorrectly. Power down the system, and simply flip the cable over on the floppy end of the chain.

RAID or IDE?

Your PC can't see your hard drives? Please note that high-end motherboards with built-in IDE RAID may require that you set a motherboard jumper or perhaps a setting in the BIOS that switches operation between Ultra DMA and RAID modes. Also double-check the master/slave relationships of your IDE devices and reseal the IDE cables if necessary.

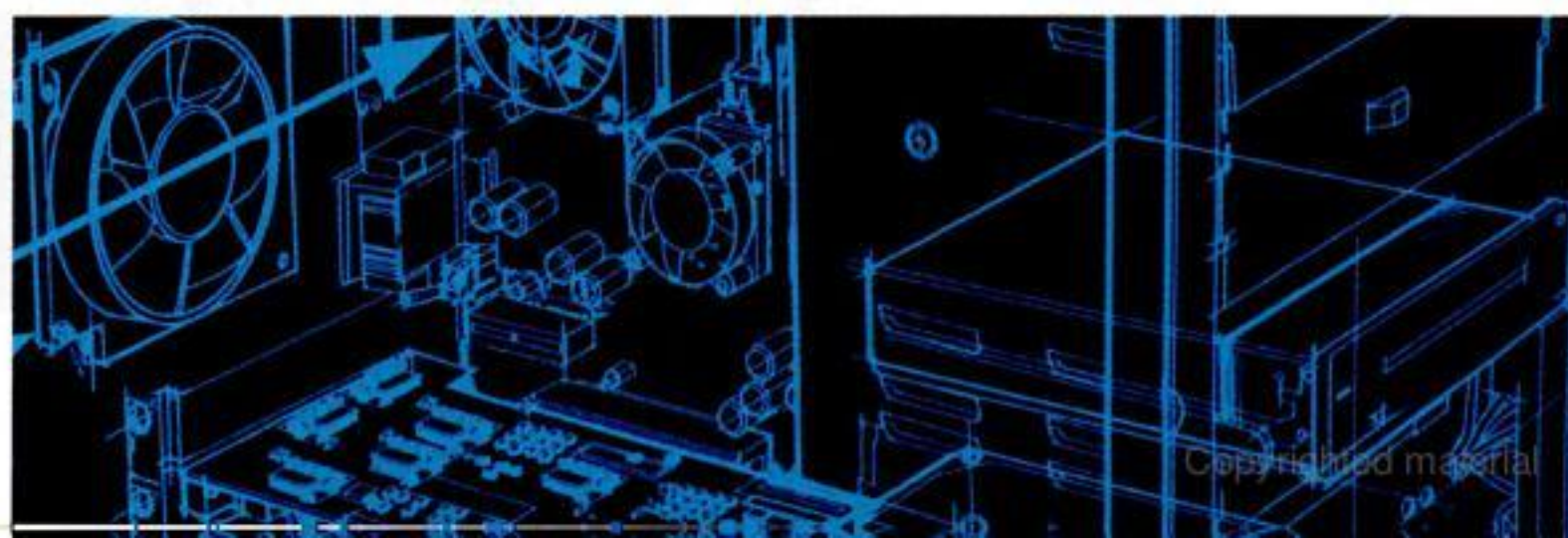
Underclocked CPU

If the CPU isn't posting the speeds you expect, it's likely your frontside bus is set incorrectly. For Athlon XP processors, make sure the motherboard is set to a 133MHz frontside bus. This setting is adjusted in the BIOS setup menu or via a physical jumper on the motherboard.

Reseat

If the system is totally black when you turn it on and doesn't make a peep (and you're sure you have the power switch hooked up correctly and the machine plugged in), reseat the graphics card, RAM, and any PCI cards you've connected. Also double-check the ATX power connector.

—GORDON MAH UNG



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Illustration: Jerald Paulsen

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The 10 Things You **MUST** Know about Building a P4 System

1 KNOW YOUR OPTIONS

There are currently two versions of Pentium 4 available. First, there's the original "Willamette" version that runs from 1.5GHz to 2GHz and fits into either Socket 423 or 478, depending on when it was manufactured. Second, there's the newer "Northwood" version (aka Pentium 4 "A"), which starts at 2.2GHz and fits into only Socket 478. Compared to Willamette, Northwood uses a more efficient process technology (for lower power consumption and heat generation) and offers twice the L2 cache for a grand total of 512K. Always go with the "A" version if you have that option.

2 THE SOCKET SWITCH

When browsing for a motherboard at Rutherford's Mobo Bazaar, don't grab the first box that screams "Pentium 4 compatible!" and head to the cashier. If you want clock speeds greater than 2GHz as well as the ability to use the newer and faster Northwood P4, make sure your board boasts Socket 478. Many vendors will steer you to the obsolete Socket 423 because they want to clear inventories, so make sure you know what you're buying.

3 MEMORY MATTERS

The Pentium 4 CPU is happy to cohabitate with three memory types: PC133, DDR, and RDRAM. Your job is to pick the right one. PC133 is cheap but slow, and will only break your heart in the long run. For all-out Pentium 4 performance, the answer is still RDRAM—just make sure you buy a motherboard with Intel's 850 chipset. If you don't plan on using a Pentium 4 Northwood CPU and you don't expect to upgrade your PC to 2.4GHz or beyond, buy a DDR motherboard that uses Intel's 845 DDR or VIA P4X266A chipset. DDR is cheaper than RDRAM and offers more or less the same performance, but is expected to bottleneck the P4A once the CPU passes the 2.4GHz mark.

4 PERFECT PAIRS

So you went with RDRAM? Just remember that the 850 chipset's dual-channel configuration requires that you populate memory slots in pairs. This means you must fill two RIMM slots with modules of identical speed and capacity (though the modules don't have to be made by the same company). Refer to your motherboard manual to find out which RIMM slots feed which channels, and remember to fill empty slots with CRIMMs (that is, "continuity" RIMMs, which are essentially dummy modules).

5 THE FUNNY PLUG

Because the Pentium 4 requires so much power, Intel ordained a new square-shaped plug that supplies extra juice to the CPU. So, when buying your case or power supply, make sure it reads "Pentium 4 compatible" or "ATX12V." Most P4-ready power supplies should handle any hardware config you throw at 'em, but just to play it safe, you should buy at least a 350-watt supply from a reputable vendor such as PC Power and Cooling, Enermax, or Antec.

6 CASE STUDY

When Intel introduced the P4 in January 2001, the CPU's heatsink required a computer case with four strategically placed screw holes—the heatsink was so heavy, it had to be bolted directly to the case! So, if you're going with a Socket 423 Pentium 4 CPU, make sure your case is compatible. Later Socket 478 Pentium 4 heatsinks use a plastic clip that firmly bolts to the motherboard, thus doing away with the need for a special case.

7 DRIVE SAFELY

Make sure you load your motherboard's chipset drivers immediately after loading your OS (you can get them from your motherboard vendor's web site—check back often for newer and improved updates). If you don't load these drivers, the chipset and OS will never really work correctly and you'll suffer a big performance hit.

8 HIT THE ACCELERATOR

If you're going with an Intel 850, 845, or 845-DDR chipset, you have two options for IDE drivers: standard Ultra DMA drivers or the newer Intel Application Accelerator drivers. Essentially, IAA is a fancy-pants name for the advanced UDMA driver for Intel 800-series chipsets. IAA drivers take special advantage of the Pentium 4 to "pre-fetch" data from the hard drive before the CPU asks for it. Intel says IAA offers better boot times to the tune of 58 percent in Windows 2000 Professional. IAA also cracks the 137GB limitation in the native Windows driver. Moral of the story: Run these drivers!

9 THE B VERSION

Don't hold your breath if you're waiting for the mysterious Pentium 4 "B" version, an unconfirmed P4 that ups the frontside bus from 100MHz quad-pumped to 133MHz quad-pumped. Intel won't even acknowledge this fabled CPU's existence. PC vendors tell us the "B" version will be offered later rather than sooner, so if you're holding out for it, you might as well wait for Pentium 5—or Pentium 18.

10 SMACK TALK

As the owner of a new P4 system, you'll find yourself swatting away the snide comments of AMD fan-boys. Here's your essential retort: Your CPU may not offer the most efficient core architecture, but it probably runs at a higher frequency than that Athlon around the corner and sits inside a rig that's generally more compatible with third-party hardware and software.

—GORDON MAH UNG

The 10 Things You **MUST** Know about Building an Athlon XP System

1 THE MOTHERLODE

If you're a hardcore gamer intent on using a GeForce3-level videocard, you should consider buying an inexpensive motherboard based on the KT266A chipset; they range in price from just \$85 to \$145. If you're not committed to GeForce3-level acceleration, you might consider one of the soon-to-be-released nForce-based motherboards. They'll be slightly more expensive—ranging from \$150 to \$200—but they'll give you more onboard features, such as integrated GeForce2 graphics, saving you the purchase of an add-in videocard. The KT266A and nForce chipsets will provide similar performance, so onboard features and pricing should help you finalize your decision. Check out www.amdmb.com for extensive Athlon mobo info.

2 HEAVY HEATSINKS

By far the hairiest aspect of building an Athlon XP system is the installation of the CPU heatsink. If you're not careful, you run the risk of hearing the dreaded "crack" of your processor's core. Safety starts with choosing the correct heatsink. There are literally hundreds of them available for the Socket A format, but you need to pick the safest one for your purposes. Check out the approved heatsink list at the AMD web site. Go to www.amd.com and type "Athlon XP thermal solutions heatsinks" into the main search engine.

3 SWEATY PALMS

Once you've got an approved heatsink, follow these precautions for installation: First, remove all the tape and plastic that might cover any thermal grease or thermal tape that the heatsink manufacturer provided. Second, never angle the heatsink more than a few degrees off of level from the motherboard. Doing so may put pressure on the corners of the processor core and could cause them to collapse and crumble. The correct way to install the heatsink is to lay it flat on the processor, without applying any pressure to the heatsink itself. While gently holding the heatsink in place, move the clip over the bottom side of the socket and onto the center lug. Now take the other side of the clip, and use either a screwdriver or socket adapter to gently move it to the center lug on top of the socket. Finally, immediately plug in the fan to avoid any chance of CPU burnout.

4 PROPER POWER

Because Athlon XPs run more efficiently and use slightly less power than previous Athlons, they're more forgiving when it comes to minimum power supply specs. Go back to the AMD web site and type in "Athlon XP recommended power supplies" for a list of approved supplies (the slowest XPs require at least a 250-watt supply, while the high-end CPUs need 300-watters). All Athlon XP power supplies should have a +5VDC rail from the supply to the motherboard.

5 MEMORY MATTERS

If you don't plan to dramatically overclock your frontside bus, then some inexpensive PC2100 DDR DRAM will more than suffice. But if you want the fastest, highest-yield memory chips available for the DDR platform, look for terms like "PC2700" or "DDR333" when buying memory modules. With this type of memory, you may be able to push your frontside bus from 100MHz or 133MHz to as high as 200MHz.

6 FRESHLY CLEANED WINDOWS

Among other improvements, the new Athlon XPs include the 3D Now! Professional instruction set, which natively supports Intel's SSE instructions. But please note: To leverage the new instructions, you'll need native support in the applications you run as well as support in your operating system. Microsoft was able to leverage SSE to yield a few noticeable performance improvements in Windows XP, so a clean installation of the OS will give you the best Athlon XP performance.

7 DRIVERS WANTED

After installing your OS, you absolutely must install your motherboard chipset drivers in order to ensure reliability and optimum performance for all your parts. The driver CD that came with your motherboard should have everything you need, but if you're looking for the latest drivers, check online at either the chipset manufacturer's web site or at www.amd.com.

8 BESTEST BIOS

Chances are, your motherboard was sitting in a warehouse for a couple months before you ever got a chance to take it home. This means it might be saddled with an old BIOS version, robbing you of the performance enhancements that have been released since the boards' initial introduction. Downloading the latest BIOS and flashing it to the motherboard is the best way to make sure your motherboard is operating at top form.

9 PESKY PROBLEMS

System lockups aren't infrequent in freshly built Athlon systems. To prevent them, make sure you are: (1) running the latest drivers for your all your parts—especially your motherboard and videocard, (2) using an officially supported frontside bus speed, and (3) using adequate processor and case cooling.

10 SMACK TALK

As the owner of a new Athlon XP system, you'll find yourself battling the hearsay of the Intel faithful. Just remind them that a 1.5GHz Athlon XP performs on par with a 2GHz Pentium 4. That's the same performance at a 25 percent frequency deficit! So AMD clearly offers the superior core architecture.

—RYAN SHROUT



The 10 Most Essential Motherboard Considerations

Crucial tips on buying the most important part of your new PC

Of all the components you might stuff inside your case, the motherboard is the most important. Make the right decision, and the board will support future technologies and maybe even last a CPU upgrade or two. Make the wrong decision, and you'll be tossing out the mobo before your next birthday. For more information, go to www.motherboards.org.

1 Word to the mother

If you're trying to save money on your project, skimp on the CPU rather than on the motherboard. While a 1.4GHz Athlon XP will perform on par with a 1.67GHz Athlon XP in many situations, a no-name \$50 motherboard can't even begin to compare to a \$150 "enthusiast's" board when it comes to extra features and support for future upgrades.

2 Choosing sides

First things first—are you going to build a Pentium- or Athlon-based system? If you're unsure, read pages 38 and 39 for insight. Once you've decided where your loyalties reside and what kind of memory you want to run, then it's time to think about what extra features you want on the motherboard. Do you want onboard RAID, USB 2.0, or Ethernet controllers? One advantage of buying a motherboard with onboard controllers is that you won't have to fill up all your PCI slots with expensive add-in controller cards.

3 You don't need to be a RAIDer fan

Even if you don't want to run a RAID array, having the extra IDE ports that a RAID-ready motherboard provides can be useful. With support for eight IDE devices, you can afford to put components such as high-speed CD-RW drives on their own channels.

4 PCI preparedness

You should set your sights on at least one AGP slot and five PCI slots. Any fewer PCI slots, and you're just asking for trouble down the road.

5 Feel the burn

If you plan on getting into overclocking at some point, you'll want a motherboard that features a fan on the core-logic chipset and has additional power headers for fans you might add later. Your board's BIOS should also include setup menus for fine-tuning voltage and system bus speed; the best mobos let you adjust the bus in 1MHz increments.

6 Athlon angst

If you're going with an AMD board, make sure its capacitors aren't too close to the CPU socket. If they're close, you'll have a harder time installing your CPU and might even be prohibited from installing some aftermarket heatsinks.

7 Think like a pro

Some motherboards feature AGP Pro slots, which come with extra connectors to support crazy-expensive, professional-level videocards in addition to the traditional videocards that we cover every month in the magazine. If you think you'll ever need a \$3,000 card designed for CAD, make sure your board comes with an AGP Pro slot.

8 Accessories included?

Some motherboards require a non-standard I/O shield (that's the rectangular metal plate that fits behind the serial, printer, and keyboard and mouse connectors). If your board fits in this category, make sure the shield is packaged with the board. Good mobos will also include a full set of cables and a few spare jumpers.

9 Do the reading

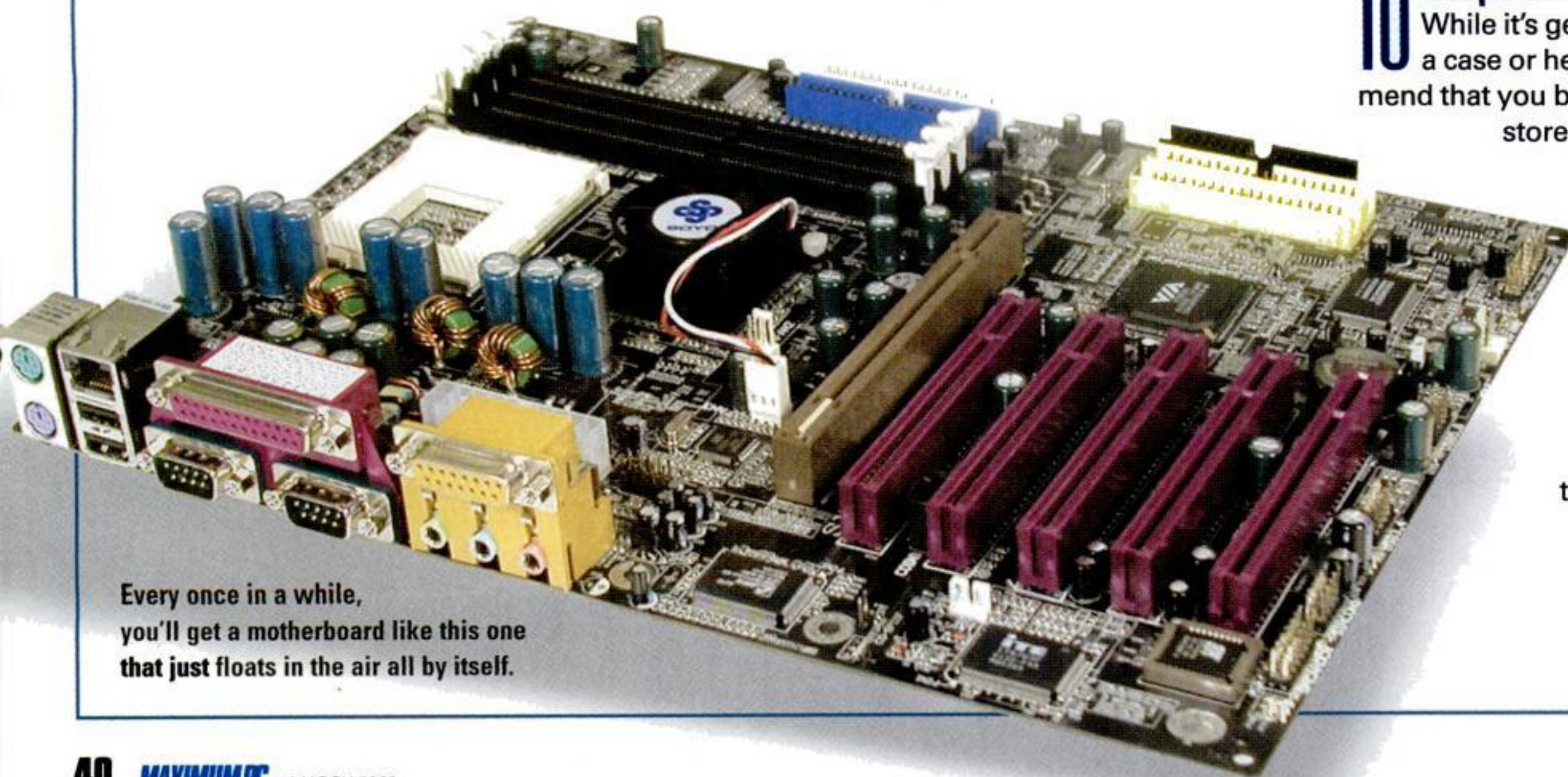
Before buying a board, go online to check the board vendor's depth of support. Does it offer a full downloadable user's manual? Does it offer recently revised chipset drivers? Because motherboards can be such squirrely components, you want to make sure your vendor is committed to end-user support and not just interested in selling lots of 1,000 to big-name system manufacturers.

10 Get personal

While it's generally OK to purchase a case or heatsink online, we recommend that you buy your motherboard at a store you can walk into. Speak to the salespeople directly and develop a relationship. You might later need their help if the board turns out to be a lemon and you need to make a return (mobo manufacturers are notorious for their poor customer service).

—GORDON MAH UNG

Every once in a while, you'll get a motherboard like this one that just floats in the air all by itself.



10 Power Supply Tips for Power Users

Don't poison your system with dirty juice!

Compared to "glamour" parts like videocards and CPUs, power supplies get the short shrift. Most people simply use the power supply that came with their case, or buy the cheapest power supply at a given output rating. After all, a top-notch power supply isn't capable of actually improving performance—or so logic dictates.

But cheap power supplies can cause serious voltage fluctuations, which can lead to read/write errors in hard drives, CPU miscalculations, and even component damage. A high-quality power supply not only prevents such mishaps from occurring, but can also extend the life of components by providing a clean, regulated stream of electricity even under extreme conditions (such as during brownouts or voltage spikes). Here are some tips to buying the best power supply possible.

1 Make sure you have enough juice

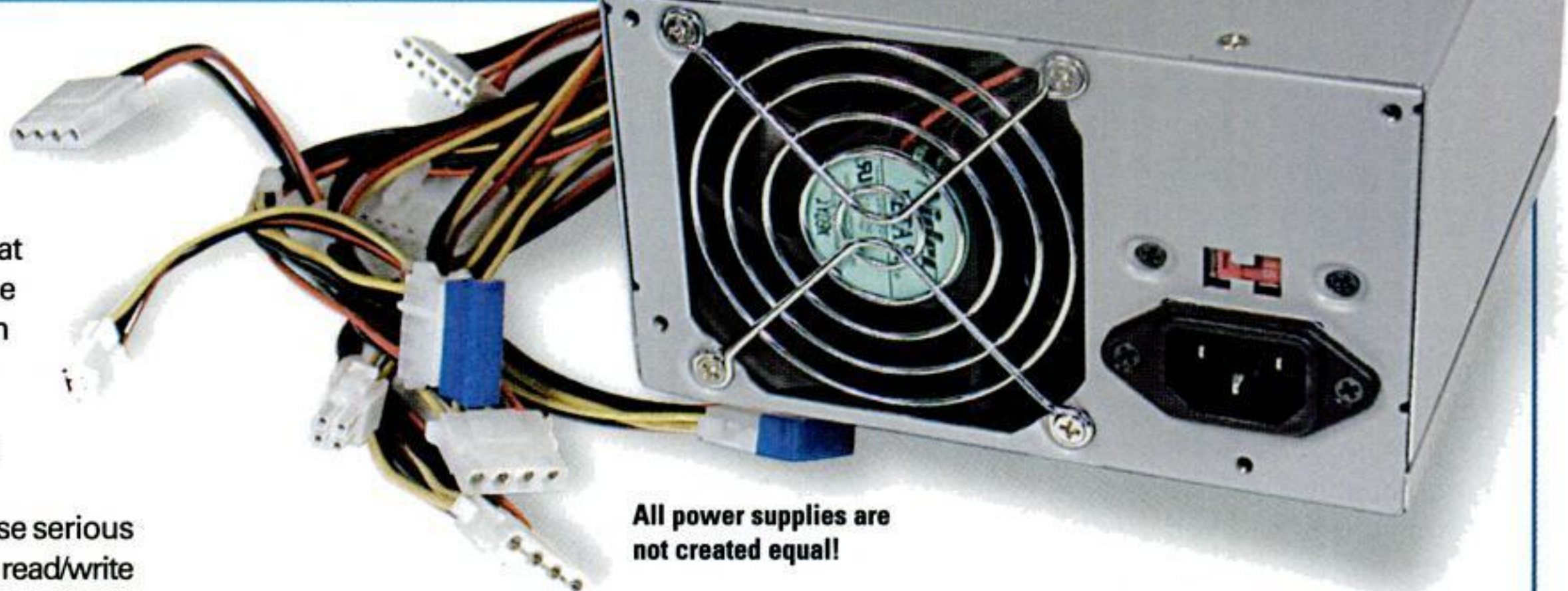
If you're running a single-processor system with just one hard drive and a couple of optical drives, almost any supply rated at 300 watts or more should work fine. But if you want to augment this basic configuration with extra fans, drives, and other incidentals, you're better off with a 400-watter. For dual-CPU configs, anything under 400 watts is a no-no. Do *not* buy a power supply that meets the exact needs of your components; always leave your equipment plenty of headroom.

2 Don't be cheap

The old adage "you get what you pay for" is particularly true for power supplies. If a power supply is rated at 400 watts but costs just \$30, then you can probably assume the manufacturer has cut corners. For a good 350-watt power supply, expect to pay around \$75. If you want more output, the price starts to increase steeply.

3 P4 compatibility

If you want a power supply that's primed for future upgrades—or one that's ready for the current crop of Pentium 4s—then make sure you get one that has a four-pin, +12v connector in addition to the standard ATX connectors. Most power supplies should have this; look for the label that says "Pentium 4 compatible."



All power supplies are not created equal!

4 Beware the bundle

Avoid power supplies that come bundled with cases. Because the PC case market is so fierce, many manufacturers bundle cheapo power in order to shave a few bucks off the total case cost. Unless you can verify the quality of a bundled supply, you should swap it out with a good aftermarket supply.

5 Play it safe

When shopping around, you can't pop open a power supply, count the transformers inside, and check for poor-manufacturing clues like staples and tape. For this reason, we strongly recommend that you stick with reputable, name-brand supplies such as those from Antec, Enermax, and PC Power and Cooling.

6 He ain't heavy, he's my...

Here's a quickie method for exposing cheapo supplies: Pick up the power supply and check its weight against other supplies of the same power rating—the heavier one is likely the better one. Why? Because lame-o power supplies often boast fewer or smaller heatsinks and transformers, which affect a power supply's ability to deliver consistent voltages.

7 Keep it consistent

Ideally, a power supply will be able to feed consistent power to your system, even under variable loads, such as during power sags and spikes. To achieve such consistency, some power supply vendors integrate "line conditioning." Essentially, this is a series of circuits that even out fluctuating voltages in the electrical current. Unfortunately, very few power supplies

actually contain line conditioning; PC Power & Cooling's Turbo Cool units are notable exceptions. Even without line conditioning, a well-made power supply should be able to keep the voltages within a certain degree of tolerance.

8 Don't believe the hype

A power supply with a high rating of 450 watts will not draw more power—and thus raise your electric bill—than, say, a 250-watt supply. The power supply's rating represents a ceiling; the supply will draw only as much power as your system requires. So splurge and get a big 450-watt supply—if you can afford it.

9 Travel alert

If you regularly take your PC overseas, be sure to get a power supply with automatic voltage switching. This automatically switches the supply to accept 230V instead of the U.S. standard of 115V. Sure, standard supplies have a voltage switch on the back, but if you forget to throw this switch and plug your PC into a European outlet, you can pretty much kiss your rig goodbye.

10 Keeping cool

In many cases (pun intended), the power supply fan can be the primary source of cooling for the oven that is your PC. If the fan fails while you're not around, your internal case temperature can get very hot, very quickly. Because of this, it's a good idea to get a supply with fan-monitoring capabilities, so your PC can shut itself down if your fan goes out. Better yet, get a supply with dual fans for even more cooling action.

—JOHN TUMMINARO

The 10 Tenets of Effective Case Cooling

Don't let your 2GHz PC turn into a 4-alarm fire!

When their circuit counts are combined, the Athlon XP CPU and GeForce3 graphics processor account for more than 90 million transistors—and every single one of those transistors gets hot, hot, hot when under duress. Worried about heat stroke? You should be. So before you put your PC together, develop a cooling strategy to prevent a serious meltdown. Here are the 10 most important things to consider when contemplating meltdown-prevention. If you follow these tips—and don't overclock your parts—you should never run into problems.

1 Front to back, top to bottom

Your rig's airflow should be the same regardless of the number, shape, and size of your fans. Air should come in at the bottom of the case and be blown toward the back. It should then be sucked up and out the top of the system. To this end, fans at the front and bottom of your case should draw air into the case, while fans at the back and

top of the case should blow air out. This includes blowhole fans, drive bay fans, and PCI slot fans.

2 Keep a clear path

When you design the cooling scheme for your case, make absolutely certain you maintain a nice "jet stream" through your case's interior. This essentially means removing unnecessary obstructions. Using cable ties to reduce the clutter of IDE and floppy cables can dramatically improve your cooling.

3 Basic cooling precedes exotica

Before you add a heat pipe or peltier cooler in order to overclock your CPU, devise a good cooling layout based on a normal system bus speed and rudimentary case fans. If your rig doesn't behave properly with basic cooling, it probably won't appreciate being overclocked with exotic cooling.

4 Know what's hot and what's not

Take advantage of the temperature monitors that are built into your motherboard, but don't rely on them exclusively. To this end, you should pick up a good electronic wired thermometer at your local Radio Shack. Attach its probe to a suspect area of your case interior, close the case's side panel, run the PC for a few hours, then check the probe's digital readout. Record the temperature, then move the probe to a new location. Repeat this procedure for different parts of your case—if you find any hot spots, consider additional cooling for those areas.

5 Optimize air flow!

A good way to perfect your system's flow (assuming you have a sufficient number of fans) is to use clear packing tape to seal any extra case holes, or cool air will leak from the back of your PCI slots before it can run over your CPU and memory. Also ensure

DANGER!

Edmar Dominicci sent us this grim example of what happens when you fail to plug in your heatsink's fan.



that you have an equal number of fans blowing air into and out of your system. You don't want to have more air coming in than going out, and you don't want to create a vacuum inside either.

6 Use a filter over your intake fans

Dust kills PCs, so grab some "filter media" to protect your computer. It's the same stuff that filters air going into your house's central air system, and most hardware stores stock it (but you'll need to cut it to the proper size). Electrostatic filters grab more dust, so they're preferable. Just remember to clean out your filter every month or two!

7 Hot, hotter, hottest

In most systems, the CPU is the hottest component, followed by the videocard, the motherboard's core-logic chipset, the memory, and finally the hard drives. Don't neglect any of these components, but remember to make cooling the CPU and videocard a priority.

8 Keep your hard drives cool

High-speed hard drives—such as the 7200rpm beasts that are common today—generate a lot of heat. Make sure you have sufficient air flowing over them to increase their lifespan.

9 Don't overstress your mobo

Don't use massive dual fans on your motherboard fan headers. Those headers are designed to power a single 8cm fan, not three 10cm fans.

10 Get the right fan/heatsink combo

If a reseller sold you an AMD processor that didn't come with a companion heatsink and/or fan already attached, go to www1.amd.com/products/athlon/thermals for a list of "thermal solutions" recommended by AMD for its entire line-up of CPUs.

Intel doesn't have an equivalent table on its web site, but it does have voluminous notes on thermal management for its CPUs; go to support.intel.com/support/processors. When you buy a fan/heatsink combo for your Intel processor, make sure it is specifically designed for your type of proc.

—WILL SMITH



Thermaltake's Volcano 7 fan is a heavy-duty fever-reducer for today's monster CPUs.

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How to Cut a Blowhole

Does your PC suffer from hot spots that just can't be cooled by conventional methods? Dead areas that defy your case's internal "jet stream" no matter what you do? Perhaps you need a blowhole. A blowhole is typically a fan mounted near one of your PC's dead zones. In our case, we wanted to install a blowhole that would direct cool air onto our PCI cards. Blowholes can also be used to extract hot air from inside the case and blow it outward. Here's what we needed for our project:

■ THERMALTAKE A1214 FAN

The A1214 is perfect for a blowhole because it adjusts its speed based on the temperature inside the case. This minimizes unnecessary noise but still gives you maximum cooling when necessary. \$15, www.thermaltake.com

■ DREMEL ROTARY TOOL

A Dremel tool is messy, but makes hole carving relatively easy. Just don't use it for any precision work. \$50, www.dremel.com

■ MASKING TAPE

Available at a hardware store for \$4.

■ DRILL

Any drill will do, just make sure you have an appropriate size bit. \$40

■ COMPASS

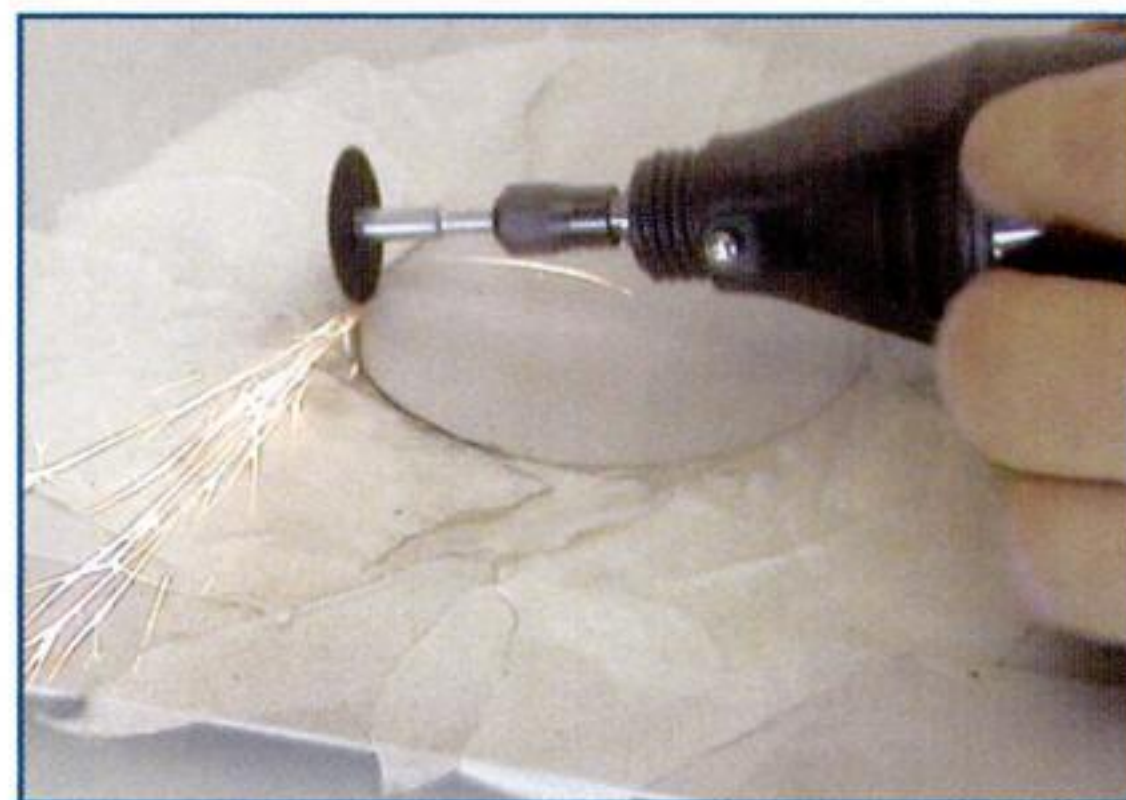
No, not the kind you use with maps; you want the kind from geometry class. Check the school-supplies section of your local grocery store. \$2

1 First, use your compass to measure the radius of the fan. In case you've forgotten, the radius is the distance from the center of a hole to its outside edge. Set your compass to the radius of the fan and use it to draw a circle on the outside of your case. Make sure the circle is in the preferred place for your blowhole before you go any further. Once your circle is marked, put some masking tape around the hole to protect the rest of your case from damage.



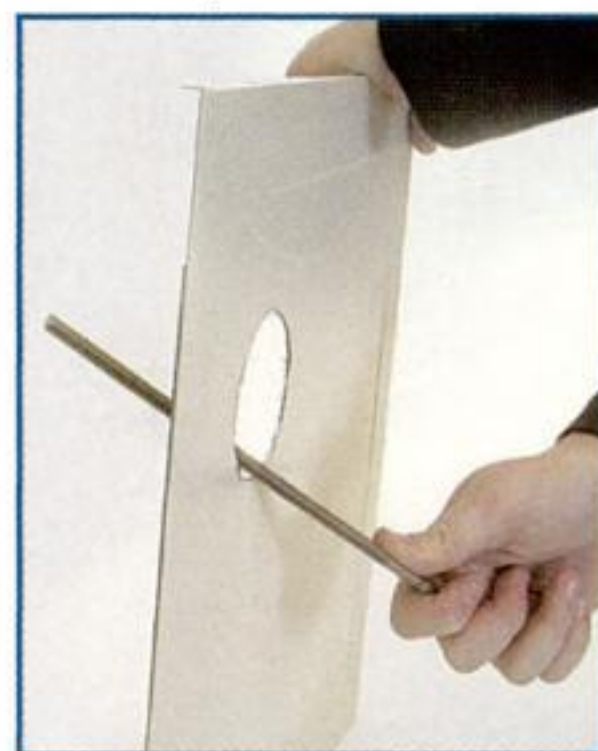
2 We'd never try using a Dremel to cut a huge case window (for that, we'd use a handheld jigsaw with the appropriate blade), but a Dremel is just fine for cutting a blowhole. Luckily, the Thermaltake plate will cover any imperfections in our Dremel cut.

Before cutting, make sure you're wearing eye protection. You should also cover your work area with newspapers, as the Dremel makes a pretty big mess. We recommend using a #540 1.25-inch cut-off wheel to make the cut. Turn your Dremel to its highest speed and apply light pressure to make the cut. Hold the blade per-

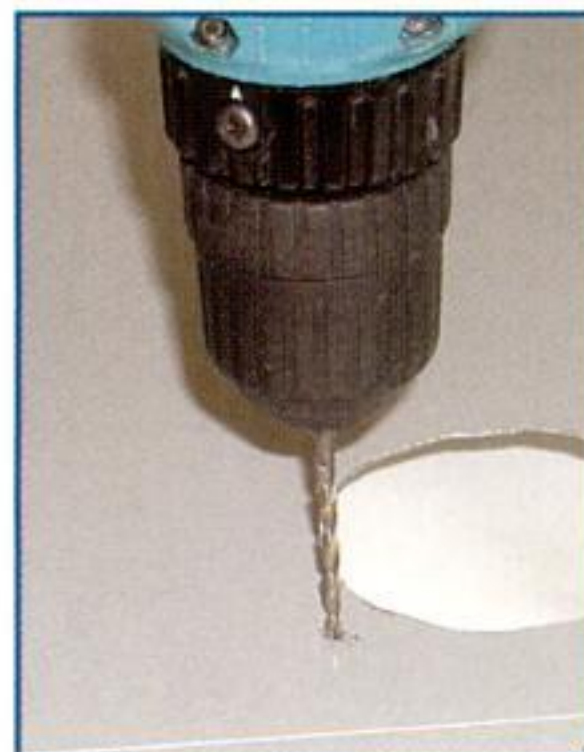


pendicular to the metal, and move it slowly along the inside of the line. Remember, you can always trim off more metal, but it's pretty hard to add metal back on!

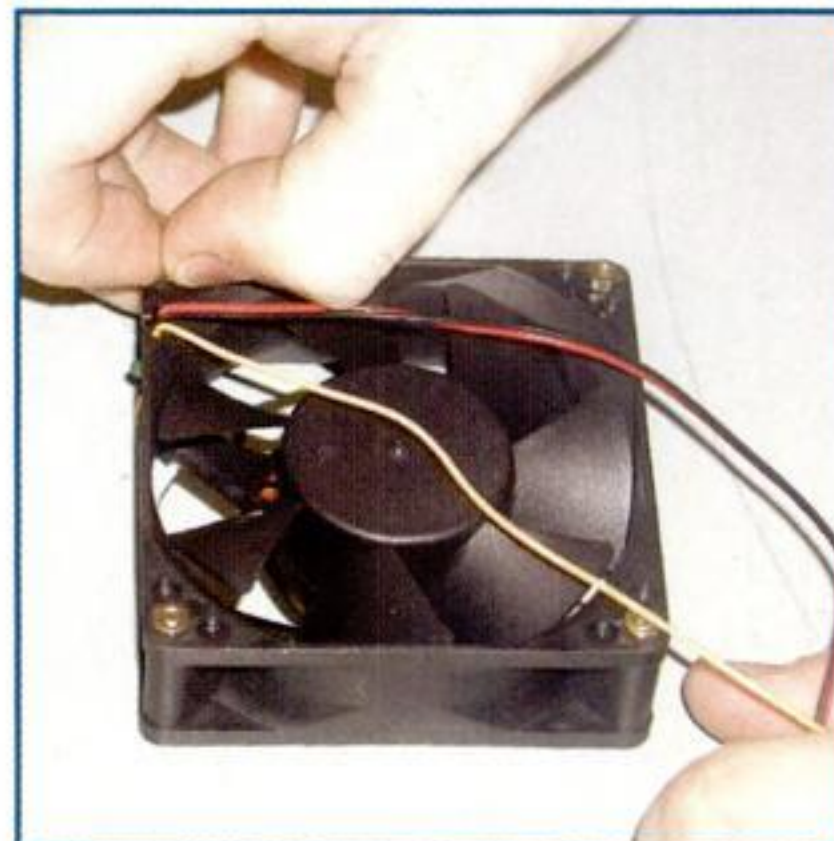
3 Buff the edges of your hole with a file. We recommend a half-round bastard file. The bastard file is good for any small burrs, but you might want to smooth out any large jags with the Dremel.



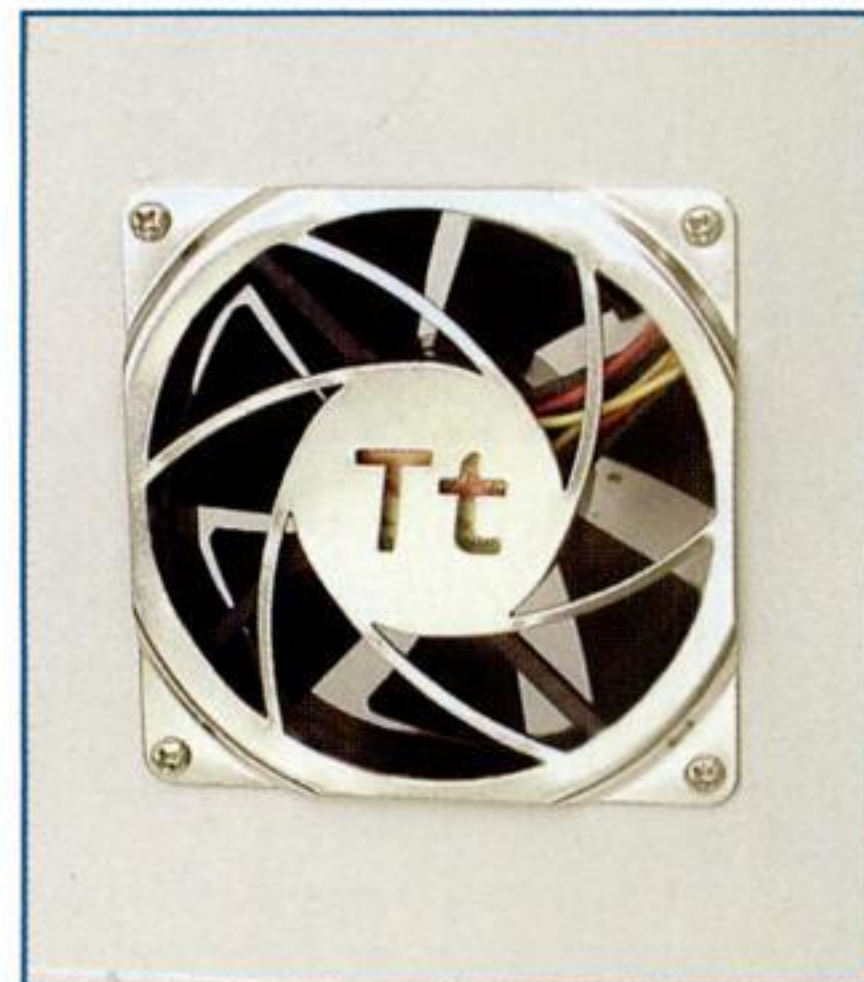
4 After you've cut out the hole, it's time to ready the mounting screws. Use the coverplate as a guide and mark four holes on the inside of the case. Drill using a bit that's just a tad larger than your screws (you might want to do a test run on a hidden part of your case to ensure that the holes created by the bit will be just right for your screws).



5 Mount the bracket on the outside of your case, and the fan on the inside. Most fans have arrows that indicate the direction of the fans rotation and airflow. After some experimentation, we decided that our blowhole should blow cool air *onto* our GeForce3 and PCI slots.



6 Admire your work! You've done your very first case mod.



Parting Shots

What do *Maximum PC* editors do when they're done building their new PC's?

Will Smith

"Once Windows is up and running, the first thing I do is grab the latest drivers for my videocard and fire up my 3D benchmarks. I can't run a new system without knowing what it gets in *3DMark2001* and *Quake 3*. Once that's done, I bump up the videocard clock speeds a bit and try again. Then it's time for the 24-hour stress test to ensure the new system is stable."

Gordon Mah Ung

"The first thing I do with a new machine is name it after a starship from 'Star Trek.' OK, I'm a 'Star Trek' nerd—so what? My fleet has included all variations of the Enterprise, as well as the Defiant and various shuttle names. Oddly, I've found that the names seem to be linked to the ships' fates on the shows. PCs I've named Voyager, for example, always seem to get trashed or need to be reformatted."

Logan Decker

"I install PowerQuest's *PartitionMagic* and *Drive Image*, and immediately image my new system to a new partition. It's the first thing I do because I'm about to install and uninstall 400 million applications and games over the next month, and sooner or later my fresh Windows install is going to look like the floor of a New York subway. *Drive Image* lets me clean things up later in a snap."



Our own
finished product!

THE LAST WORD ON SCSI

BY JIM NORRIS

SCSI isn't dead—it's just lost relevance as a desktop technology. Here's everything you need to know about one of the most misunderstood technologies in PC arcana.

SCSI—short for *small computer systems interface*—hit the scene in 1986 and has been a stalwart companion to the hardcore computer enthusiast for much of its long life. As a high-speed means of connecting virtually any type of peripheral, SCSI has more or less graduated through seven generations of specs, starting with the 5MB/sec SCSI-1 and currently topping out at the 160MB/sec Ultra160 (which is actually a sub-spec of

mands and execute them in the most efficient order—a major boon during intense multitasking), and disconnect/reconnect (which lets a drive momentarily disconnect from the bus in order to free up bandwidth for other devices).

Since time immemorial, better and faster SCSI specs have ushered in the hottest technological advancements in CD burners and hard drives. For example, faster rotation speeds, higher areal densities, and quicker seek times have typically appeared in SCSI hard drives first, with IDE drives always playing catch-up. Yet despite this glowing track record, SCSI has never been closer than it is now to losing relevance as a desktop technology, its key benefits notwithstanding (see “Benefits & Drawbacks” on page 48). To understand why SCSI is losing the battle for power users’ hearts and souls, it helps to first look at SCSI’s beginnings and the points at which the spec really started to matter to the desktop computer community.

Blame Apple

SCSI’s first true advance into the home computer front was during Apple’s Macintosh heyday, circa the late 1980s. As the technology of choice for the hip, well-heeled Apple crowd, SCSI came built into every Mac and was considered something of an advantage to the platform. Sure, some whiners claimed that SCSI devices were difficult to configure, but Mac users were in an environment that was about as controlled as was realisti-

cally possible, with a single manufacturer—Apple—guiding the vast majority of SCSI hardware implementation, as well as the operating system that would have to cooperate with the hardware.

In addition to an internal boot drive, many Mac users had four or five devices snaking from their systems in a SCSI chain, all performing without incident (though sometimes devices had to be reordered for glitch-free operation). The uniformity of the SCSI hardware, along with the agreeable nature of the rudimentary SCSI protocols, made for an enviable result: an easily configured, slotless expansion bus capable of some of the highest-speed throughput of its era.

Despite all this wonderfulness, the term “SCSI voodoo” became common parlance among Mac users who were beginning to discover SCSI’s finicky nature when mixing device specs, upgrading operating systems, and just generally playing with Macintosh fire. Meanwhile, on the PC side, users were connecting external devices with dedicated ISA interface cards (in the case of scanners, for example) or via the parallel port. Internal hard drives were connected using the RLL, MFM, and EDSI drive controller technologies—and if you thought IDE was dumb, these three precursors were the Moe, Larry, and Shemp of data transfer. The ISA bus, parallel port, and pre-IDE interfaces were poor substitutes for SCSI, as anyone using a PC equipped with a SCSI controller

(Continued on page 49)

“The term ‘SCSI voodoo’ became common parlance among Mac users who were beginning to discover SCSI’s finicky nature...”

SCSI-3). As a PC standard, SCSI has done some amazing work throughout the years, handling connectivity for everything from network adapters to scanners and, of course, optical drives and hard drives. SCSI was even used by Radius to connect external color displays to early Apple PowerBooks!

In addition to offering industry-standard throughput speeds, SCSI offers kick-ass expansion options: The typical PC allows for just four IDE drives, but with SCSI you can have up to 15 different devices daisy-chained together on a single channel. Perhaps even more importantly, the later SCSI specs offer some invaluable special features, such as parity error-checking (to ensure the integrity of data transfers), command queuing (which enables devices to accept multiple com-



Here's an in-your-face look at three connector stalwarts:
1) High-density, 68-pin. SCSI-3, come to Papa!
2) High-density, 50-pin. SCSI-2, who's your Daddy?
3) Low-density, 50-pin. Only SCSI geriatrics need apply.

SCSI Benefits & Drawbacks

Submitted for your approval, a quick cheat-sheet on SCSI's finer nuances, both positive and negative.

PROTOCOL INTELLIGENCE:

One of SCSI's major selling points is its ability to queue requests (up to 255) and execute them without requiring assists from the CPU or motherboard chipset. Along with this, SCSI devices also have the ability to disconnect from their host system bus in order for the bus to tend to other pending tasks. Together, these features are key to SCSI's effectiveness in multi-user, multitasked, low-latency environments. Years ago, when IDE was a fairly new technology, SCSI's protocol intelligence was immediately tangible when comparing IDE and SCSI system response. Today, however, advancements to the IDE protocol and drive control electronics have done much to eliminate noticeable IDE bottlenecks on single-user workstations.

DRIVE SPEED:

When hard drive companies make breakthroughs in platter rotation speed and areal density, they usually introduce the fruits of their labor in SCSI drives before IDE drives, which is the main reason why SCSI drives produce better benchmarks scores, bus protocols notwithstanding. For this reason, the hardest of the hardcore power users will opt for SCSI, if only to enjoy the absolute fastest internal hard drive technology. There's no arguing this point—faster, denser platters mean faster throughput, and fast is good. However, the time difference between the release of state-of-the-art SCSI drives and state-of-the-art IDE drives is getting shorter every day, so there's a rather high premium to be paid for that brief RPM or areal density advantage.

Another drawback to high-speed SCSI drives is their intense power requirements. Most OEM, desktop-grade power supplies (and even some of the better aftermarket supplies) aren't of sufficient quality to power a RAID array composed of 10,000rpm or 15,000rpm drives. In fact, many power supplies can't pump out sufficient juice to even wind up the drives, especially if a user has packed his system with a high-speed videocard and other power-draining goodies.

FLEXIBILITY:

The ability to add a slew of devices to a single controller is one of SCSI's finest assets. IDE remains tied to the master/slave paradigm, which limits it to closely coupled storage devices on a 15-inch cable. But SCSI chains can include 15 devices (not counting the host controller), and extend as far as 25 meters in best-case scenarios.

Unfortunately the cumbersome nature of attaching devices to SCSI chains via thick, ropey cables and arcane ordering and termination rituals has only gotten worse over time. As a result, few of today's users are willing to give up the plug-and-play convenience and general ubiquity of USB for the speed of SCSI, especially when faster USB 2.0 products are right around the corner. Certain high-bandwidth applications—such as film-scanning—remain firmly in the SCSI camp for obvious reasons, although this may change as competing technologies mature.

SPACE AND CASE:

Running high-end SCSI probably means building a RAID array at some point—and that means a new, larger case (probably a workgroup server enclosure) or an external RAID box. A good deal of the cost of a server's chassis comes from incorporating properly filtered power supplies. That's power *supplies*, plural, as most servers have more than one supply for the sake of protective redundancy, or to offload the RAID power drain. Server cases, especially if they are A/V certified, are also much larger than regular desktop cases because they require a lot of internal space to support multiple high-speed SCSI drives.

A good server case starts around \$200 to \$300, and roughly the same applies to RAID enclosures, which, like pure server cases, must be equipped with extra cooling. High RPM hard drives get hot as a griddle and can cause havoc in a system filled with temperature-sensitive components. Numerous extra fans are often required, making these systems even less suitable for home use—they often sound like a vacuum cleaner and belch out a lot of hot air when you fire them up.

COST:

This is the silver bullet, the wooden stake in SCSI's heart. SCSI is expensive. How expensive? Well, at press time, you could buy a 60GB IDE drive (7200rpm, ATA/133) for the same price as a single 3-foot Ultra SCSI cable. SCSI hard drives are anywhere from 50 to 100 percent more expensive than their IDE counterparts, and controllers run from hundreds to thousands of dollars. And if you're serious about SCSI and are planning to build a RAID array, you'll need to spend a staggering amount of money on your drives, cables, case, power supplies, and so on. Money well spent? Hard to say when you can have a second PC—or make a down payment on a new car—for a similar outlay.



(Continued from page 46)

could readily attest. Even as early as 1987, the SCSI spec was already offering hard drive performance advantages, though these advantages were essentially rendered moot by Microsoft and Apple operating system deficiencies—the OSes' multitasking features were either too primitive (in the case of Windows) or simply nonexistent (in the case of MacOS) and couldn't leverage SCSI's advanced data access features.

Final Stop on the Expansion Bus

In a cruel twist of fate, SCSI's heyday as a populist consumer technology ended around 1995 with the introduction of faster protocols. True enough, SCSI devices now had higher throughput ceilings, but average-Joe end-users paid the price in the form of termination requirements, rigid device ordering standards, and delicate and expensive connectors. For example, the 68-pin external connectors used to connect Ultra Wide SCSI devices were notorious for bending and deforming even under careful use. Once damaged, the cables were rendered useless, as cable repairs were expressly dis-

To All the SCSI Specs We've Loved Before

Here it is, folks, SCSI's fragmented history in a tight little 4 x 2-inch rectangle.

Standard	Better Known As	Bus Width	Throughput	Max Devices on Chain	Cable Type
SCSI-1	Asynchronous	8-bit	4MB/sec	7	50-pin
SCSI-1	Synchronous	8-bit	5MB/sec	7	50-pin
SCSI-2	Wide SCSI	16-bit	10MB/sec	15	68-pin
SCSI-2	Fast SCSI	8-bit	10MB/sec	7	50-pin
SCSI-2	Fast Wide	16-bit	20MB/sec	15	68-pin
SPI/SCSI-3	Ultra SCSI	8-bit	20MB/sec	7	50-pin
SPI/SCSI-3	Ultra Wide	16-bit	40MB/sec	7	68-pin
SPI-2/SCSI-3	Ultra2	8-bit	40MB/sec	7	50-pin
SPI-2/SCSI-3	Ultra2/Wide	16-bit	80MB/sec	15	68-pin
SPI-3/SCSI-3	Ultra3/Ultra160	16-bit	160MB/sec	15	68-pin

couraged. Even more detrimental to SCSI's reputation, legacy issues began rearing their ugly heads: Mixing old and new SCSI devices often caused stability problems, speed degradation for the fastest devices in a chain, and sometimes even hard drive corruption, which needs to happen only once before an end-user becomes gun-shy about using a particular technology.

Stability concerns shot to the fore in 1997 with the introduction of Differential SCSI, later called High Voltage Differential, or HVD. By reducing susceptibility to signal noise, HVD promised longer cable lengths without a negative affect on bus speeds or device stability. In theory, cable lengths could now extend to a whopping 60 feet. But in actual prac-

(Continued on page 50)

SCSI's Greatest Hits!

ATTO SiliconDisk II

Say hello to one of the most intriguing chunks of hardware we've ever covered. The SiliconDisk II was actually a solid-state hard drive that used DRAM modules (instead of magnetic hard disk platters) to store data. Capacities ranged from 64MB to 2.6GB, depending on the drive. Coming correct with dual Ultra Wide SCSI-3 ports, the SiliconDisk II could hit 70MB/sec throughput via both ports, along with 0.02ms seek times (even today, the best SCSI hard drives offer about 3.5ms average seek times). In July 1998—when we gave the drive a 9 verdict and a Kick Ass Award—we called this performance "unreal." Intended for transaction servers used by large banks, the SiliconDisk II cost as much as \$32,000. Today, it's no longer for sale.

—JP



SCSI Ultra160 Feature Set

Here's a look at what makes the current ultimate SCSI iteration so damn compelling.

DOUBLE TRANSITION CLOCKING:

Using a concept similar to the one employed in DDR memory, double transition clocking allows both edges of the REQ and ACK signals to be utilized for clocking data, which effectively doubles the 40MHz rate of Ultra SCSI to 80MHz. This, in turn, doubles the theoretical data rate of Ultra2 SCSI from 80MB/sec to 160MB/sec.

DOMAIN VALIDATION:

This is a process by which the SCSI host adapter automatically queries and tests each of the peripherals on a SCSI chain for its maximum level of performance, and individually caters to each device on the bus at the highest speed the device will run. Note that legacy SCSI devices may affect the maximum throughput of Ultra160 devices on the chain, limiting overall performance.

CYCLICAL REDUNDANCY CHECKING

CRC, a data integrity checking protocol, replaces the parity check system used in previous SCSI implementations. Similar to the systems used in Ethernet, Fibre Channel, and other technologies, CRC detects and handles a much wider array of problems, with a greater level of accuracy, than the parity-based systems of the past.

needed to be expanded. Model-specific replacements were on long backorder or simply unavailable, and in some reprehensible cases, manufacturers actually shipped LVD drives to replace HVD units. The resulting havoc was predictably tremendous, bringing many weekends of woe to unsuspecting IT professionals.

The most recent round of confusion hit the SCSI community with the introduction of the SCSI-3 standard. Six attributes differentiate SCSI-3 from its immediate SCSI-2 predecessor, but only a single one of these attributes needs to be implemented on a device for it to receive a SCSI-3 designation. Unfortunately, unless all the devices on a SCSI-3 chain share the exact same attributes, no single device on the chain will be able to leverage all of its own best features.

To help alleviate this problem, a further refinement to SCSI-3—Ultra160—was implemented. To be called Ultra160, a device must feature three of the SCSI-3 specs' most critical improvements, namely cyclic redundancy checking, double-transition clocking, and domain validation. These features were selected because they provide so much bang for the buck. Today, Ultra160 represents the pinnacle of available SCSI technology (the 320MB/sec Ultra320 spec is in development, but products were still vapor as

(Continued on page 52)

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tice, users with anything more than a simple SCSI configuration reported problems ranging from lower perceived bandwidth to dreaded drive corruption. Low Voltage Differential SCSI, or LVD, was released shortly after HVD to remedy these problems—but at what price? The LVD standard wisely traded shorter maximum cable length for increased reliability. Unfortunately, LVD also introduced yet another set of hard drives

that were only partially operable with their SCSI cousins! The upshot? Even hardened PC enthusiasts began cursing SCSI for its compatibility problems.

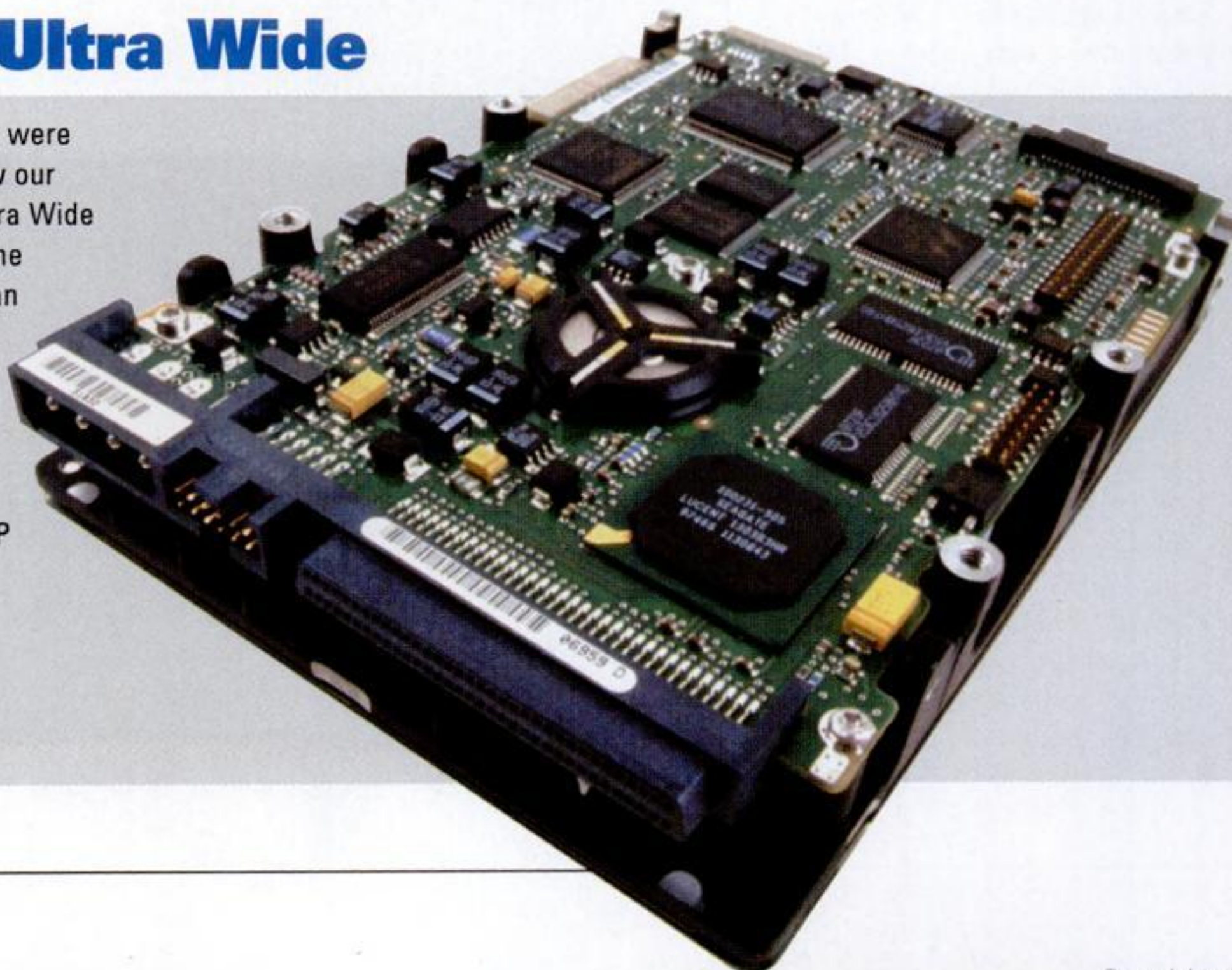
The compatibility situation was exacerbated by the fact that the introduction of LVD spurred a near-wholesale abandonment of HVD drives. And because HVD drives were used in a lot of server RAID arrays, network techs found themselves ass-out when their HVD drives needed to be replaced or their arrays

SCSI's Greatest Hits!

Seagate Cheetah Ultra Wide

Back in the day when 10,000rpm rotation speeds were still a hard drive novelty, the 9GB Cheetah blew our ever-lovin' minds. Bundled with a dual-channel Ultra Wide SCSI adapter, the \$800 drive stole our hearts—to the tune of a 1998 Gear of the Year Award, as well as an appearance in that year's Dream Machine project. The Cheetah had an average seek time of 8.5ms and hit 16MB/sec average reads and 19.3MB/sec average writes. These benchmark numbers are quaint by today's standards, but back then, they couldn't be beat.

—JP



Sometimes the key to getting along is keeping things *separate*—including the data on your *hard drive*.



PartitionMagic®—The old saying goes, “fences make good neighbors”. At PowerQuest we know this holds true with more than just people. Your hard drive is full of valuable information...okay, maybe some is not so valuable, nonetheless it needs to be protected and organized. That's why we created PartitionMagic.



PartitionMagic allows you to safely and easily create partitions on your hard drive without destroying data. It's like creating fenced areas for your business data, the kids' games, even information you download can have its own area. Sound complicated? Not really. We provide a step-by-step wizard interface that walks you through the entire partitioning process, allowing you to easily create, resize, redistribute, merge or copy partitions. And if you're not sure you like where the fence went up, PartitionMagic lets you preview and modify your changes before you make them.

Other features include:

- *Manage multiple operating systems*
- *Drag and drop partitions*
- *Undelete partitions*
- *NTFS merge*
- *Large drive support (80GB)*

See your local software retailer, visit www.powerquest.com/partitionmagic, or call 1-888-497-9998 and discover what a good fence can do for your data.



PartitionMagic lets you maximize your hard drive space, run multiple operating systems, and organize & protect your data.

(Continued from page 50)

of press time). Sadly, despite Ultra160's clear-cut definition, even the most seasoned power users will tell you that, as a whole, SCSI "standards" are too fractured for their own good. No wonder so many

"SCSI burners produced far fewer coasters than did their IDE cousins—until the advent of BurnProof technology, that is."

hardcore hardware hackers go with simpler technologies just to avoid the headaches.

Muscling In: USB & FireWire

While USB, USB 2.0, and FireWire aren't serious options for connecting hard drives in a RAID array or populating server farms, they are among the main reasons why SCSI is essentially dead as a desktop technology. True enough, IDE hard drives, with their ability to hit 133MB/sec, can certainly give Ultra160 SCSI drives a run for their money, but SCSI's role on the desktop hasn't faded because of improvements to the IDE bus. No, SCSI has lost relevance because there are now better ways to quickly connect external PC peripherals.

Back in the day, SCSI gave home users the ability to add a scanner, CD burner, or similar peripheral in exchange for just a single motherboard slot and set of PC resources. SCSI bus speed, while important, was less of an attraction than SCSI's ability to connect multiple devices to a PC without cracking open its case. But this benefit was rendered moot with the advent of USB. True enough, USB got off to a rocky start, but once standardized support appeared in Windows 98, the new spec all but wiped SCSI from the map as an external device connector. Just walk into your nearest computer superstore and look at the rows and rows of USB-connected devices for a vivid illustration of just how profoundly SCSI has lost this battle.

Another harsh blow was dealt by Apple itself when its own FireWire technology hit the scene in 1997. Because USB's bandwidth was limited to a paltry 1.5MB/sec, USB wasn't a feasible technology for connecting digital video peripherals—thus SCSI still remained relevant for DV fanatics. But FireWire, with its 50MB/sec throughput, changed all that. Sony and its brethren began integrating FireWire directly into their DV cameras and decks, making SCSI suddenly unsuitable for some of its last holdouts. Perhaps more importantly, the focus on R&D—and the excitement it brings to the hard-

ware community—also shifted away from SCSI as the interface standard became more and more associated with problems than with speed.

Despite all these black marks on SCSI's record, even as late as 1999 *Maximum PC* was still evangelizing SCSI as the best interface for CD burners. Why? Because SCSI-based burners rarely suffered buffer-underrun errors, thanks to SCSI's naturally low CPU utilization and natural ability to maintain constant data throughput, even on a congested bus. Thus, SCSI burners produced far fewer coasters than did their IDE cousins—until the advent of BurnProof technology, that is. Once again, SCSI got trumped by a new evolving standard! In this case, BurnProof wizardry gave IDE-based CD burners the ability to completely wipe away the possibility of buffer underruns.

Maximum PC hasn't reviewed a SCSI CD burner since BurnProof's emergence.

The Bottom Line

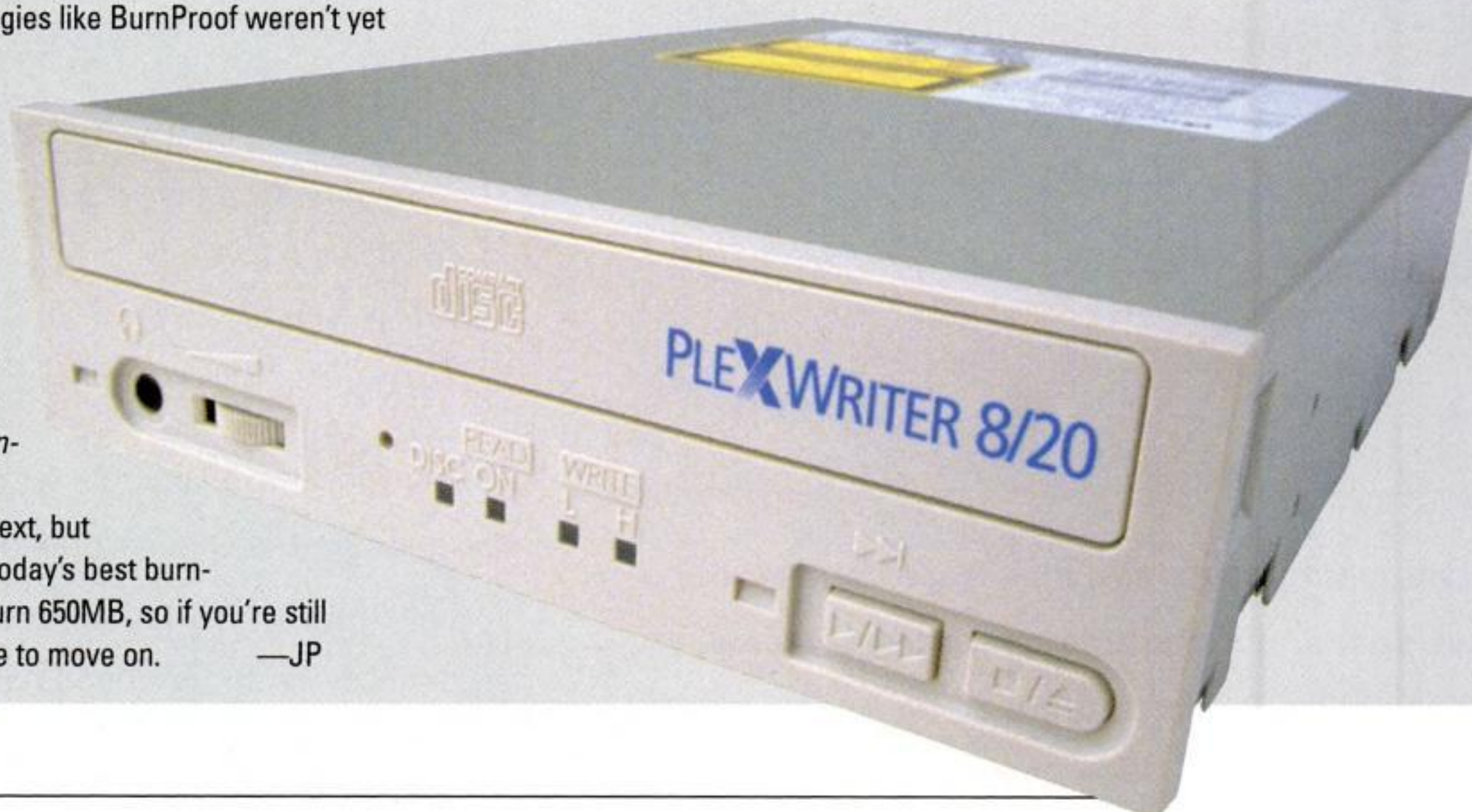
So what is SCSI good for these days? Well, it still makes sense for legacy server arrays. SCSI protocols—and the high-end hard drives that use them—are essentially designed to curtail performance bogies that desktop users rarely encounter, such as the congestion that occurs when multiple users hit a single database file.

"But wait," you say, "I'm always run-

SCSI's Greatest Hits!

Plextor PlexWriter 8/20

In 1999, anti-buffer underrun technologies like BurnProof weren't yet available, so SCSI drives like the PlexWriter 8/20—with their immense 4MB cache allotments—were de rigueur for coaster avoidance. In fact, in our May 1999 issue, we called the PlexWriter 8/20 "the flat-out best CD recorder that's ever passed through our lab." And we followed up that declaration with the qualifier that the drive "created a 646MB data disc in an *astounding* 11:14 minutes." Yow-zaa! OK, so the italics didn't appear in the original text, but we were indeed enthused. Of course, today's best burners take fewer than three minutes to burn 650MB, so if you're still running the old Sexy Plexy 8/20, it's time to move on. —JP



ning multiple programs and using large database files on my computer at work—won't SCSI help me in those situations?" The answer is no. SCSI drives really make sense only for serving terabyte-size databases that are accessed by hundreds of users simultaneously, or for streaming video and audio from popular web sites. In other words, the SCSI drives need to be on the server end, not on the desktop end. The small speed increase that SCSI affords a desktop user is actually a poor trade-off for the cost and complexity of SCSI implementation. You'd be better off investing in more RAM, a faster processor, or a larger monitor. Even better, you might consider buying high-speed IDE drives for use in a much less demanding—though still quite potent—ATA/133 RAID configuration. All of these purchases would be more meaningful to a power user than going SCSI just for the bragging rights.

In the final analysis, SCSI is a high-performance protocol in the same way monster trucks are high-performance vehicles—they're absolutely necessary to tackle a few very specific, high-end tasks, but they're not particularly fun, useful, or even sexy for 99.9 percent of all the driving situations you'll ever encounter.

Jim Norris is an IT consultant and writer covering the high-tech industry. He formerly headed the labs at Windows NT Systems magazine, and has run IS departments for several publishing companies.

But I Still Want My SCSI

If you wish to stick it out with SCSI and enjoy the benefits of faster drives without the headaches, some guidelines and accessories are highly recommended. Try www.granitedigital.com if you don't know where to start shopping.

GET NEW CABLES:

Spend the extra time and money and get your cables from a reputable manufacturer or dealer. Buy the best you can afford—especially when selecting external cables—or that new drive will just cause heartache.

DON'T CUT CORNERS:

SCSI may be expensive, but buying a used controller card is ill-advised. Many deals on SCSI cards are for older HVD cards, or for cards that were stripped from a workstation bundle. These "good deals" may have incomplete feature sets, damaged connectors, or other problems that aren't immediately noticeable.

INVEST IN A DIAGNOSTIC CABLE OR BOX:

These don't come cheap, but then again, you didn't select SCSI to save money, right? If you ever encounter any SCSI-related problems, these devices will make sense of the SCSI voodoo and tell you exactly where your problem lies and what's causing it. Granted, actually *fixing* the problem might be expensive too, but at least you'll know what's wrong.

DON'T MIX DEVICE TYPES:

When it comes to mixing device specs, try to keep all the members of a SCSI chain as close to each other as possible. For example, don't cohabitate ancient SCSI-2 CD burners and scanners with more modern SCSI-3 hard drives and tape drives on the same bus, even if technically possible. Instead, older devices may be better hosted by their original, older SCSI cards. To this end, you might attach a pair of high-end hard drives to a new SCSI card for optimal speed, then use the steady and reliable Adaptec 2940 card for use with low-end external devices.

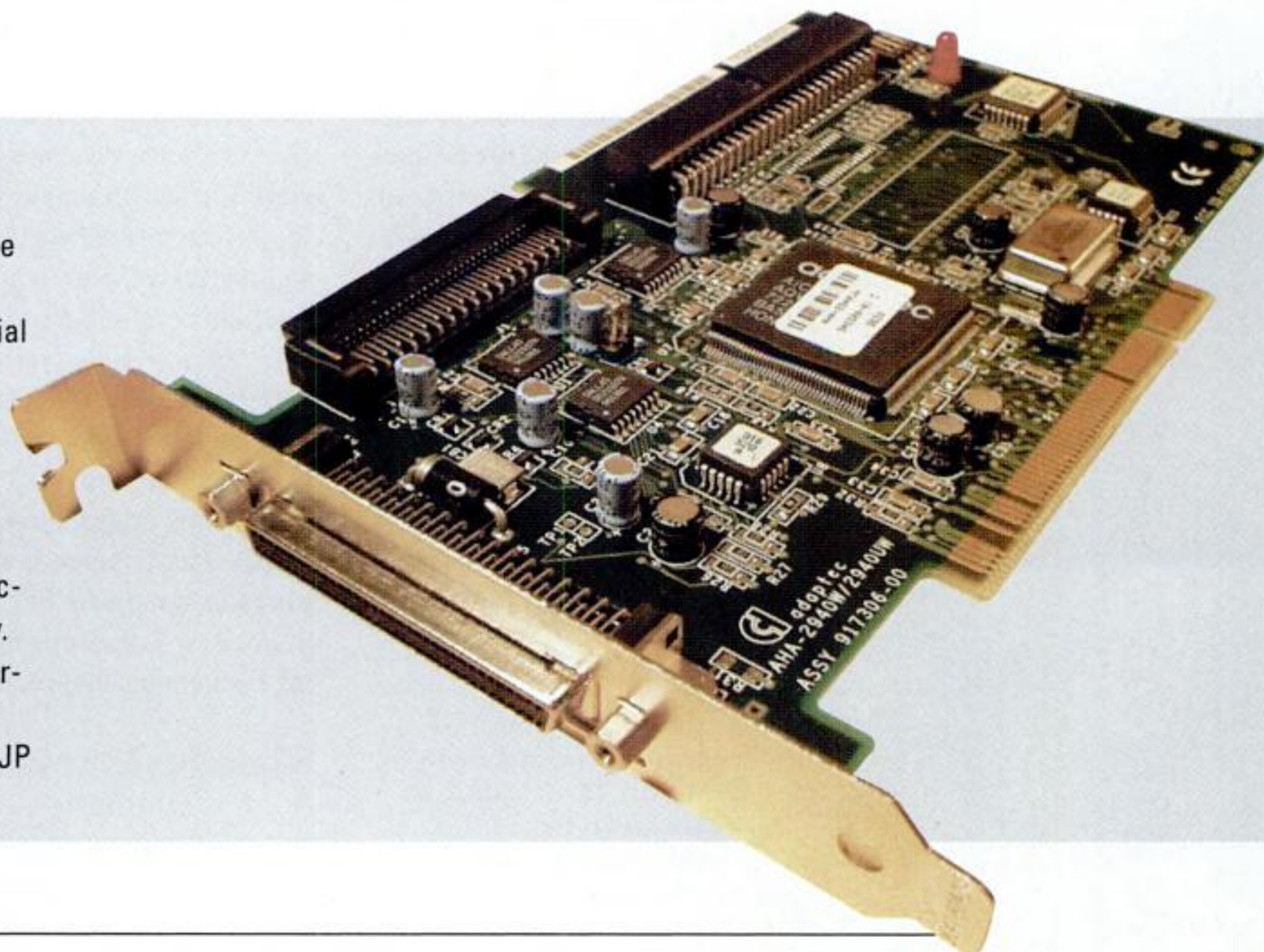
"Don't cohabitate ancient SCSI-2 CD burners and scanners with more modern SCSI-3 hard drives and tape drives on the same bus..."

SCSI's Greatest Hits!

Adaptec 2940

Many SCSI controller cards have come and gone, but none boasts the longevity of Adaptec's 2940 line. As Jim Norris, author of "The Last Word on SCSI" puts it: "The original 2940 was the Jeep Willys of SCSI—nothing afterward lived up to its stability and utility." Indeed, our editorial staff has always immediately associated SCSI with the Adaptec name and made a point of reviewing all the company's SCSI controllers in *boot*, the magazine that eventually became *Maximum PC*. Here we picture the Adaptec AHA-2940W Dual—its 68-pin external connector supported Ultra Wide SCSI-3, while its two internal connectors supported SCSI-1 and Ultra Wide SCSI-3, respectively. By using the external connector along with one of the internal connectors, you were afforded two SCSI channels for the price of one card.

—JP



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Dual Athlon Dilemma

I want to upgrade my system to a dual Athlon rig, but I'm not sure which motherboard to use. The Tyan Tiger motherboard I saw in your December issue ["Gear of the Year 2001"] looked good, but it lacks an onboard RAID controller and has mostly 64-bit PCI slots (does a 32-bit PCI card work in a 64-bit slot?). Would you still recommend this board, or are there any other alternatives?

—DANIEL SEYMOUR

By the time you read this, a host of dual Athlon motherboards that use AMD's new 760MPX chipset should be available from Abit, Asus, Tyan, and the other usual suspects. The 760MPX uses the same north bridge as the 760MP chipset used in the popular Tyan Tiger MP, but AMD has added full 64-bit, 66MHz

"It's also possible the machine is infected with a virus or Trojan that's doing terrible, terrible things to your hard drive."

PCI support to the MPX version. Many of these boards will likely have onboard IDE RAID as well. 64-bit, 33MHz PCI slots support 32-bit PCI cards, but 64-bit, 66MHz PCI slots typically do not. In fact, you can't even insert a 32-bit PCI card into a 64-bit, 66MHz slot unless it's a universal card. The new 760MPX south bridge also adds additional bandwidth to the chipset to handle the faster 64-bit, 66MHz PCI standard. People who need additional speed for AV/DV RAID will want the faster 66MHz PCI support. The original Tyan Tiger MP with its

64-bit PCI is relatively uncommon right now, but you can expect to see more cards, like this Adaptec Quartet 64 four-port Ethernet card, in the future.

six PCI slots (two 32-bit and four 64-bit) may be preferable for people who have mostly 32-bit PCI devices.

Ghost in the Machine?

My computer is randomly accessing the hard drive whenever the machine sits idle for a while. I have shut down Norton Antivirus, and there is nothing else running in the background. I have looked at the Windows Task Manager and nothing jumps out at me. I'm concerned about this reducing the life of my hard drive by spinning it up unnecessarily. I have read on newsgroups that this may be a problem with the Apollo 133a chipset 4-in-1 drivers and Windows XP. Is there any truth to this? I'm running WinXP Home on a custom-built machine with an ASUS P3V4X BIOS rev.1005 Date 6/12/2000, Apollo Pro133a chipset with the latest 4-in-1 drivers.

My system does not have this problem under Win2000 or 98SE.

—STEVE KRONER

It's possible that an application such as *Find Fast* from Microsoft Office is thrashing the hard drive while you're not using it, but it's more likely that Windows XP Home is responsible for the thrashing by using the PC's "downtime" to relocate files on the hard drive so they start faster. It's also possible the machine is infected with a virus or Trojan that's doing terrible, terrible things to your hard drive. Turn off *Find Fast*, scan for a virus with the latest virus definitions loaded onto your machine, and, of course, make sure it isn't another program you loaded that's doing a little maintenance in the background. If you're on a network, it's also possible your little sister is secretly dragging her entire MP3 collection onto your machine.

Mobile Music Mix-Up

I have a refurbished Dell Latitude CP M233XT notebook, with a Pentium 233MHz running on Windows ME. Here's the problem: I have a Jam MP3

player that I often like to use with my friend's desktop. I want to use it with my notebook, but I haven't had any success. When I plug the MP3 player into my notebook's USB it doesn't detect the MP3 player's memory, but it knows the MP3 player is there, because when I turn off the MP3 player, a message tells me to reconnect the device to the USB, or something like that. So it detects the hardware but can't read its contents and memory. I figured it must be OS incompatibility.

—ALVIN ARZAGA

Assuming you have Windows correctly installed and configured, it's quite possible the USB controller in the notebook is the culprit. Early USB hardware was simply a joke, and in the days of the Pentium 233, few USB items were available that even worked correctly. If you have to use your player with your notebook, consider loading the songs onto the player by using a standard ATA PCMCIA card adapter or purchasing a USB 1.1 or USB 2.0 PCMCIA adapter.

CPU Crusher

I am using an AMD Athlon XP 1900+ on an ECS K7VTA3 1.1 motherboard. I just bought an ABIT KG7 without RAID, and I performed the annoying process of moving over all my hardware, etc. When I was all done setting it up, I turned it on, and guess what? Nothing happened. I double-checked everything, praying I didn't crush the CPU core. After I made sure everything was alright, I tried again, and I noticed that the CD-RW drive would open and close over and over by itself. To make a long story short, I hooked my K7VTA3 back up and everything works fine. I'm stumped about what to do.

—WARREN BORSUK

Since you've determined that you didn't crush the CPU core, the problem is more likely a dead or incorrectly configured motherboard. Or perhaps something—such as the CPU, memory, graphics card, or even the motherboard itself—wasn't seated correctly. If you can, fire it up with a minimum of hardware in the machine. Make sure you have a speaker hooked up to the machine so you can hear

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a POST error or series of beeps that can be explained in your motherboard manual. And reset the CMOS in the system.

It's also possible your motherboard doesn't like your power supply. The Doctor has personally witnessed problems between certain motherboards and certain power supplies because

"There's one last trick you can try, but... the risk is that you'll burn your CPU and be unable to use it at all."

the boards don't support the proper power signal that's required to turn over the system. Don't introduce too many variables into your troubleshooting by swapping multiple pieces at a time. Swap one component for another until you can determine why the machine isn't booting.

Upgrading a Hootie CPU

I have an Intel motherboard, the SE440BX2, and a Pentium III 450 CPU that I want to upgrade. Ideally, I'd bump my CPU to an 800 or 850MHz P-III. I have been searching for info regarding this and can't get a straight answer from anyone. Do I have to change the motherboard out with the CPU or can I stick with my current mobo?

—W. CROWELL

It depends on which version of the old Seattle 2 board you have. Look on your motherboard for a white sticker that has a series of lines resembling a UPC code. The sticker should also bear a series of numbers and letters. The sequence following the "AA" on the sticker tells you what CPU you can use. If you see 754552-200 or higher (-201, -202, -203, etc.), 754558-200 or higher, or A01450-200 or higher, your SE440BX2 supports the faster "Coppermine" Pentium IIIs up to 850MHz. Make sure you're running the latest P14 or Production BIOS before you upgrade. If the number on your board is not among the examples listed here, it likely won't support a faster CPU unless stated so by the system manufacturer.

If your computer doesn't fit these criteria, there's one last trick you can try, but it's very risky. The risk is that you'll burn your CPU and be unable to use it at all. First, keep your old BIOS. *Do not* update it. Go out and buy a 700MHz or 800MHz Coppermine P-III that runs on a 100MHz bus, as opposed to a 133MHz bus. Then, simply swap out the CPU. Even if your board doesn't officially support the higher speed, a locked CPU will always run at 8x, so you will get 800MHz out of the machine. Unfortunately, if your board doesn't support the Coppermine, it probably also won't support the lower Coppermine voltages, and your new CPU may have an exceedingly short life.

Mystery BSoDs

I have a GeForce3 card with a P4, 256MB of RDRAM, and an Intel 850 Series motherboard. I get Blue Screens of Death (BSoD) all the time in Windows (I am not overclocking anything whatsoever). As soon as I load up a game, such as *Max Payne*, it loads, then gives me a BSoD. I also get BSoDs when surfing the web, and I get random application crashes (not BSoDs) in addition to this. The only way I can get my system stable is to turn down the hardware acceleration slider. This, however, disables all DirectX so I can't play games.

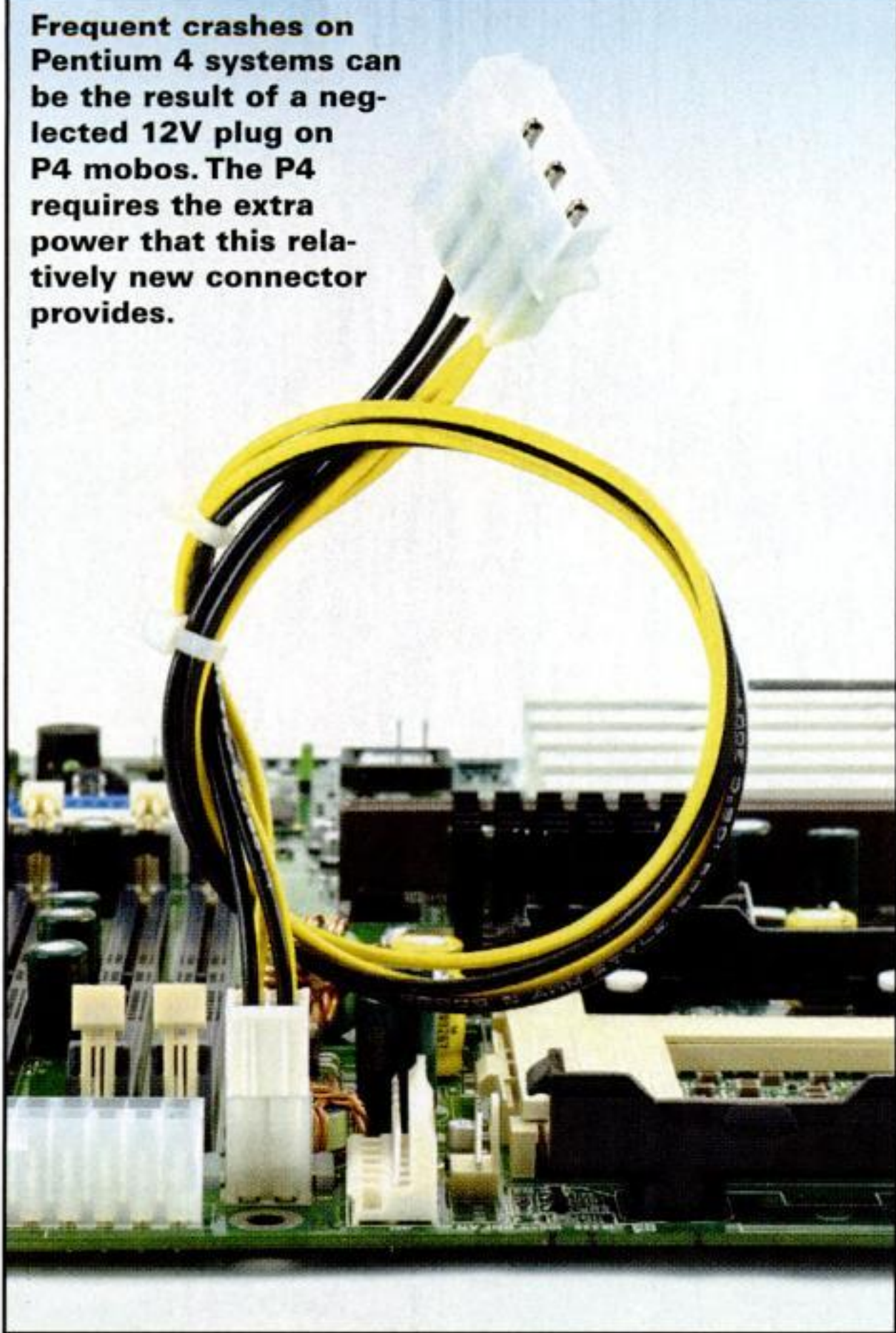
I have done both a clean install of Windows XP Pro with just my GeForce3 card installed, and also a clean install of Windows 2000 Pro with just my GeForce3 installed. I get the same types of errors in both OSes. However, when I had Windows 98 installed, it worked fine. I believe my problem is either bad RDRAM or an issue with my GeForce3 drivers in Win 2000/XP. I currently have nVidia's 23.11 drivers installed. Has anyone else had problems with the GeForce3 in Windows 2000/XP? I've heard of the 60Hz refresh rates prob-

lem and downloaded the fix for this, but I still get the BSoDs. I get different error messages on my blue screen, but usually it's PAGE_FAULT_IN_NONPAGED_AREA, or DRIVER_IRQL_NOT_LESS_OR_EQUAL, or it lists win32k.sys. I have been troubleshooting this for more than three weeks, and I'm at a dead end. Thanks for any suggestions.

—ERIC ABE

Ahh, this one always reminds the Doctor of that famous quote from The Saint: "The driver is always broken." Indeed, the error message "DRIVER_IRQL_NOT_LESS_OR_EQUAL" points to a problem with a driver under Windows XP/2000. That means you have a driver that's attempting to address the wrong part of memory. Remove any PCI card, USB device, or other add-on device and install just your graphics card, hard drive, and the optical drive needed to install the OS. Install the fresh OS, load the latest chipset INF files from your motherboard vendor, and make sure you have the latest drivers for XP/2K from your motherboard manufacturer for any onboard RAID, LAN, or Audio device—or simply disable them in the BIOS before you install the OS. Not to insult you, but make sure you are using the correct drivers for the correct OS and that you have the 12V plug connected to your motherboard. Finally, you are quite correct that the problem may also be a piece of faulty hardware. And, not to harp too much on this subject, but if you're running a \$5 power supply, that could also be the offender; the Doctor has seen a wealth of strange problems resulting from the low-quality power supplies that ship with cases. ■

Frequent crashes on Pentium 4 systems can be the result of a neglected 12V plug on P4 mobos. The P4 requires the extra power that this relatively new connector provides.



Second Opinion

More on Verboten Attachments

In the February 2002 issue, a reader asked about executable attachments in *Outlook 2002*. You gave him a bone-headed answer [suggesting he look for a solution on Microsoft's Knowledge Base]. Take a look at *DetachXP* at www.mcdev.com/software.htm. It rules over *Outlook XP*.

—JEFF GALLANT

You're right, Jeff. *DetachXP* is a nifty little software app that does all the legwork involved in re-enabling the attachments Microsoft decided were verboten.



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Actual items may differ from pictured. **Quantispeed architecture operates at 1400MHz ***Quantispeed architecture operates at 1467MHz ****Quantispeed architecture operates at 1533MHz

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How To...

■ ■ ■ A step-by-step guide to tweaking your PC Experience

MAKE YOUR OWN DVD

The quick 'n' dirty guide to burning your own DVD movie discs, playable on almost any set-top DVD player!



BY LOGAN DECKER

With prices for recordable DVD drives falling faster than Enron stock, there isn't any reason to fumble around with pathetic videotapes anymore. In this how-to, we'll show you how to create a DVD movie that can be played on most set-top DVD players and PC DVD-ROM drives. Requiring just half an hour to complete, this project is very quick. How dirty is it? Well, that's up to you.

Recording a DVD isn't as simple as burning footage to recordable DVD media. You could do that, sure, but

you'd just be creating a data DVD, which can't play in most set-top players. Just like audio CDs, DVD-Video must be written in a very specific way in order to be compatible with set-top players and DVD-ROM drives. Luckily, the software that comes with most DVD burners does most of the hard work for you, such as compressing your video and creating the proper file structure for the disc. This leaves you more time to do what you've always wanted to do: direct.

The Essentials

In order to create your own DVD, the main things you'll need are a DVD burner and its appropriate media. For maximum compatibility, we suggest Pioneer's DVR-A03 drive (**image 3**) and 4.5GB DVD-R media. The DVD-Video discs created from this combination have played on all but one playback device we've tested the media on. The same can't be said of the two rewriteable formats, DVD-RW and DVD+RW.

If you have a FireWire-equipped DV camera, you can plug it directly into your PC and send video footage straight to DVD. But if you want to archive footage from analog sources—such as videotapes—you'll need a video-capture card that converts the analog signal to a PC-friendly digital signal. Avoid USB-based capture devices, as the bandwidth of USB 1.1 is insufficient to capture DVD-quality video. For our project, we used Dazzle's Digital Video Creator II (**image 1**) video capture kit, which supports realtime compression of video to the MPEG-2 standard and is ideal for DVD-Video.

For DVD mastering, we used *MyDVD 3.0*, which is available from www.sonic.com for \$100 (or \$70 if you're upgrading). Please note: Some version of *MyDVD* usually comes bundled with today's DVD burners.

As for purchasing your DVD-R media (**image 2**): You can find discs for as little as \$5 a piece if you buy them in packs of 10.



1 Cinematography

We used the Dazzle capture kit to digitize footage of our favorite pooches, Lucy and Greta, from a Sony Hi-8 Handycam. The DVCII

provides preset recording templates for sending video to specific formats. In our case, we selected DVD/MPEG-2, which is the highest-quality setting.



2 The Director's Chair

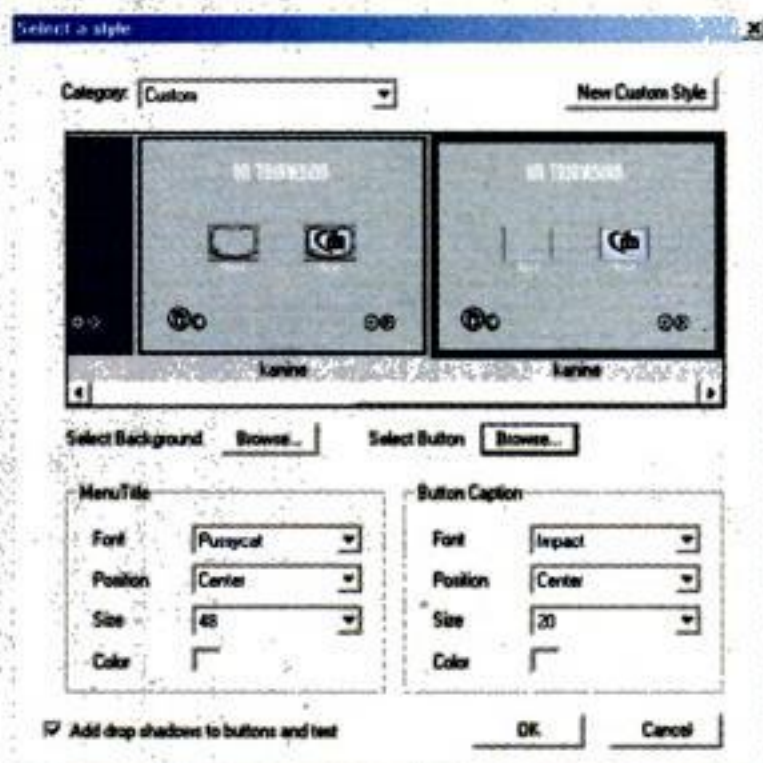
It's time to fire up *MyDVD 3.0*. You'll see a toolbar at the top of the screen, and a welcome wizard in the center. You'll be asked what kind of project you're doing. Select "Start a New DVD." Note that you can actually record directly to DVD from within *MyDVD*, but you



won't be able to customize the menus or edit footage other than that at the beginning or end of clips. In our case, we knew we'd need to edit more extensively—for example, Lucy's embarrassing bathroom break in the middle of one take—using Dazzle's video-editing capabilities.

3 Preproduction

Select one of the pre-made template styles from the scroll list for your menu. Don't worry about customizing the template just yet—you can modify your work later with different fonts, backgrounds, and button styles after you've imported your video. (We chose "onTV," one of the tamer selections.) You'll then be presented with the DVD authoring equivalent of a blank canvas.



4 Title Sequence

Click on the "Get Movies" button; a dialog box will prompt you to find your media. You can drag and drop files directly into the dialog box as well. Each clip or media file will be prepared for DVD production, converted to a proper format if necessary, and automatically assigned its own button named after the file. If you drop in more than six files, *MyDVD* will automatically create a new menu and insert a small navigation button at the bottom right of the window. Click directly on the file or menu titles to change them. Our DVD disc, "Kanine Kapers," is a compilation of compelling moments from film classics as reenacted by actresses Lucy and Greta.



5 Deleted Scenes

Of course, there were a number of gripping sequences that didn't make it into our final cut, so we're going to let viewers into some of the behind-the-scenes action by dropping in a menu button to access these other clips. To do this, we clicked "Menu" at the top right corner of the window, and *MyDVD* created a menu button that we renamed "outtakes." We then just double-clicked the new menu button to access the new, blank menu, and followed the same procedure as above to add more video to this submenu.



6 Dress Rehearsal

Now we want to see how our disc will work in a DVD-ROM drive or set-top player—*MyDVD* lets you audition discs before they're burned to media. Click "Preview," and a remote control pops up on the screen. You can click anywhere on the screen just as you would a software DVD player. Or, to emulate the set-top experience, use the buttons on the remote to navigate your disc. This way, you can confirm that menus behave the way you want them to, and that the titles are correct. If not, the project



is still fully editable at this stage, so feel free to delete buttons, add menus, or move things around. Remember that if you're recording to DVD-RW or DVD+RW media, you can also save the project, edit it later, and burn it again to the rewriteable media.

7 The Final Cut

When you're happy with the results you've auditioned within *MyDVD*, exit the preview by clicking the "x" at the top right corner of the remote. Then just click "Make Disc," select the "Make DVD" radio button, make sure your DVD burner appears in the drop-down box, and leave the write speed at "Auto."

If you're making copies for everyone in your family, or sending your "amateur" videos off to several different places, you might want to choose "Burn DVD to Hard Drive" instead. That way you'll avoid having to re-transcode the video for multiple copies.

The burn process should be fairly quick—even a full 4.7GB of video should record in about a half-hour using DVD-R media.



Epilogue

MyDVD has already become something of a standard for consumer DVD authoring. Although it's extremely easy to use from start to finish, it's light on features and customization. Once you get the hang of the process of capturing and encoding your footage, you'll want to trade up to a more full-featured product, like Sonic's *DVDIt!* In the future, we'll show you how to use the more advanced DVD authoring software to create professional effects, such as looping video in chapter stops and adding background music to your menus. ■

(NOTE: No animals were harmed in the making of *Kanine Kapers* or this tutorial.)

RAID Revisited

Does striping together hard drives really lower read performance?

In our January issue "Speed Trials" story, we reported that multiple hard drives striped together in a RAID 0 array offer slower read performance than do single drives. After the article was published, we received a load of e-mails disputing our results. Our readers' general consensus was that read performance equals write performance in striped arrays.

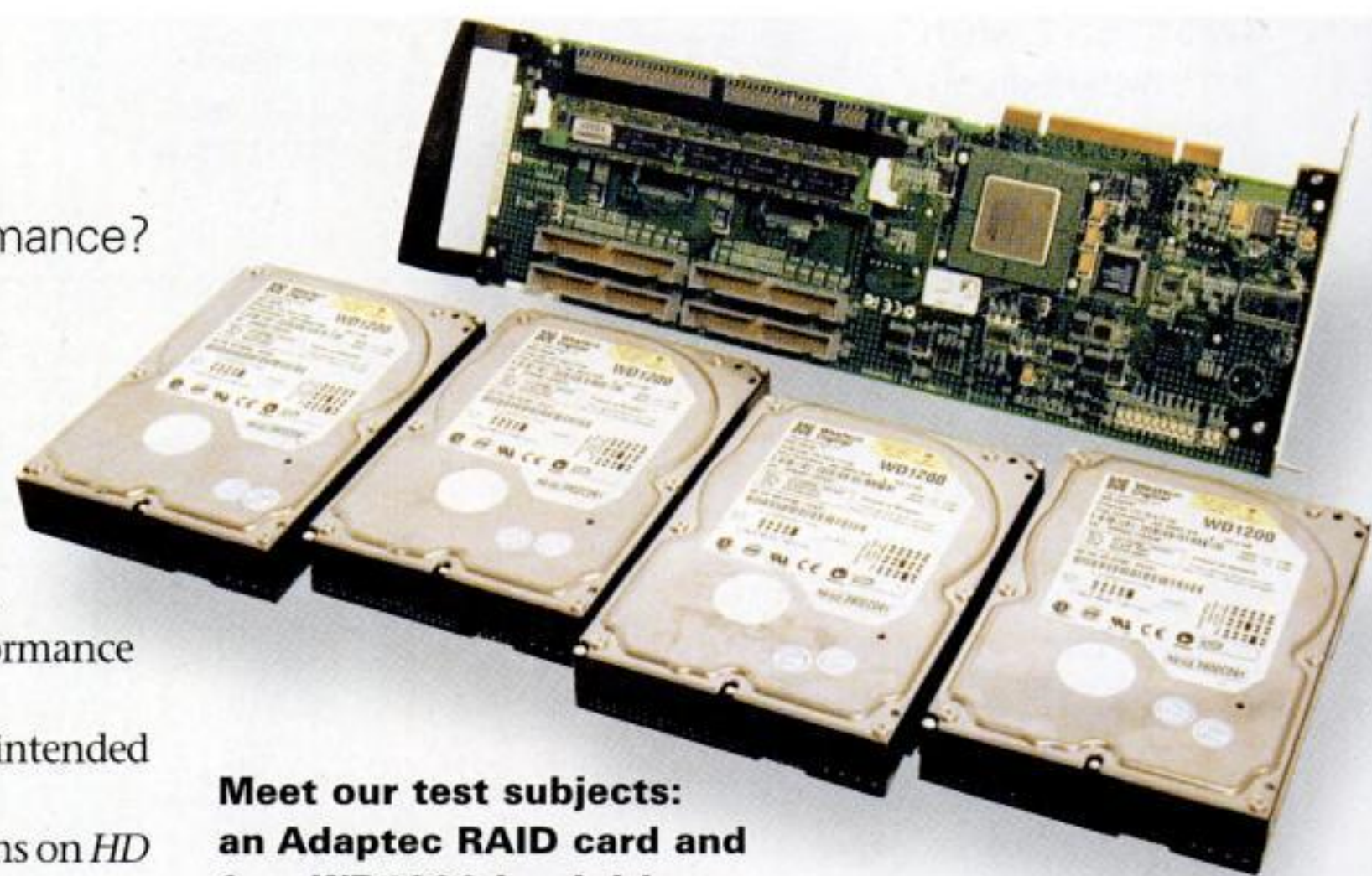
Did we royally screw up? That's the question we intended to answer in this month's Second Look report.

In our January coverage, we based our conclusions on *HD Tach*, a hard drive benchmark that isn't officially certified for RAID testing, but has nonetheless coughed up reliable and consistent RAID scores for us over the years—or so we thought. During previous RAID tests, *HD Tach* always produced results that logically scaled with manufacturer claims and our own expectations. But is it possible a benchmark might report accurate results under some conditions and inaccurate results under different conditions? Indeed it is. Especially when a benchmark isn't 100 percent certified for a specific application. We now agree with the readers who argue that *HD Tach* isn't reliable when it comes to RAID arrays. So, to cross-check the accuracy of *HD Tach*, we set out to develop a new hard drive benchmark, one that would test the true real-world performance of striped hard drives.

After some experimentation, we landed on a benchmarking scenario that we believe to be as close to bullet-proof as possible. We set up a system with 768MB of RAM and immediately assigned 540MB of that memory to a RAM disk, using *RamDisk XP* available from www.superspeed.com. A RAM disk is essentially a virtual hard drive created from system memory; it can even display a drive letter just like any other storage drive. After setting up the RAM disk, we took 540MB of large, small, and medium-size files and timed how long it took to transfer them back and forth between the RAM disk and various RAID configs. The RAID configs were based on 120GB Western Digital WD1200 hard drives, each boasting a small 2MB cache. We rebooted between test runs, fully reconfiguring the arrays each time.

So why use a RAM disk? Well, because memory is so much faster than hard drives, it can't possibly rear its ugly head as a bottleneck during writes and reads. So what we were really testing was the speed at which a RAID array can grab data bursting from high-speed memory (write performance), as well as the speed at which the RAID array can feed that data back to memory (read performance).

For these latest RAID tests, we also experimented with different stripe sizes and used an Adaptec 2400A 4-channel ATA RAID card instead of the Promise FastTrak IDE controller that we used for the January report. The 2400A is designed for server and workstation use and includes an onboard Intel i960RS processor and 32MB of SDRAM to minimize CPU utilization. The 2400A supports RAID 0, 1, 0/1, and 5. When we formatted



Meet our test subjects:
an Adaptec RAID card and
four WD1200 hard drives.

the RAID arrays with NTFS, we matched NTFS's allocation unit sizes to stripe size values.

As you can see from the benchmark chart, the RAM disk results don't jibe with our previous *HD Tach* results. To wit, under our RAM disk test, read performance actually improved when drives were striped together—a four-drive RAID 0 array beat a single drive's read time by seven seconds. So where do we stand now? Well, we're wont to drop *HD Tach* entirely, especially considering that we haven't been able to reach the *HD Tach* developers to discuss RAID testing. In *HD Tach*'s stead, we'll use our new RAM disk benchmark, which is more of a real-world test. Please write to input@maximumpc.com if you have any thoughts about how we can refine the RAM disk test.

As for RAID 0 read performance, it appears we gave it the short shrift. Nonetheless, we still question whether its speed gains are noticeable during typical day-to-day use, and we definitely question whether it's sensible to have a two- or four-drive RAID 0 array instead of a single larger hard drive boasting a large 8MB cache. Once you factor in the increased chance of failure with a multiple-drive array (if a single drive in a striped array fails, all data on the array is lost), RAID begins to look even less appealing. Still, striped RAID arrays can definitely help applications that frequently write and read to disk.

—WILL SMITH

DARE TO COMPARE

RAID Level x number of drives (stripe size)	RAM Disk read average (sec)	RAM Disk write average (sec)
RAID 0 x 4 (16KB)	39.00	27.00
RAID 0 x 4 (64KB)	35.00	20.33
RAID 0 x 4 (128KB)	37.67	19.00
RAID 5 x 4 (16KB)	70.33	68.00
RAID 5 x 4 (64KB)	97.33	71.67
RAID 1 x 2	57.33	35.00
RAID 0 x 2 (64KB)	37.33	21.33
Single drive	42.00	28.67

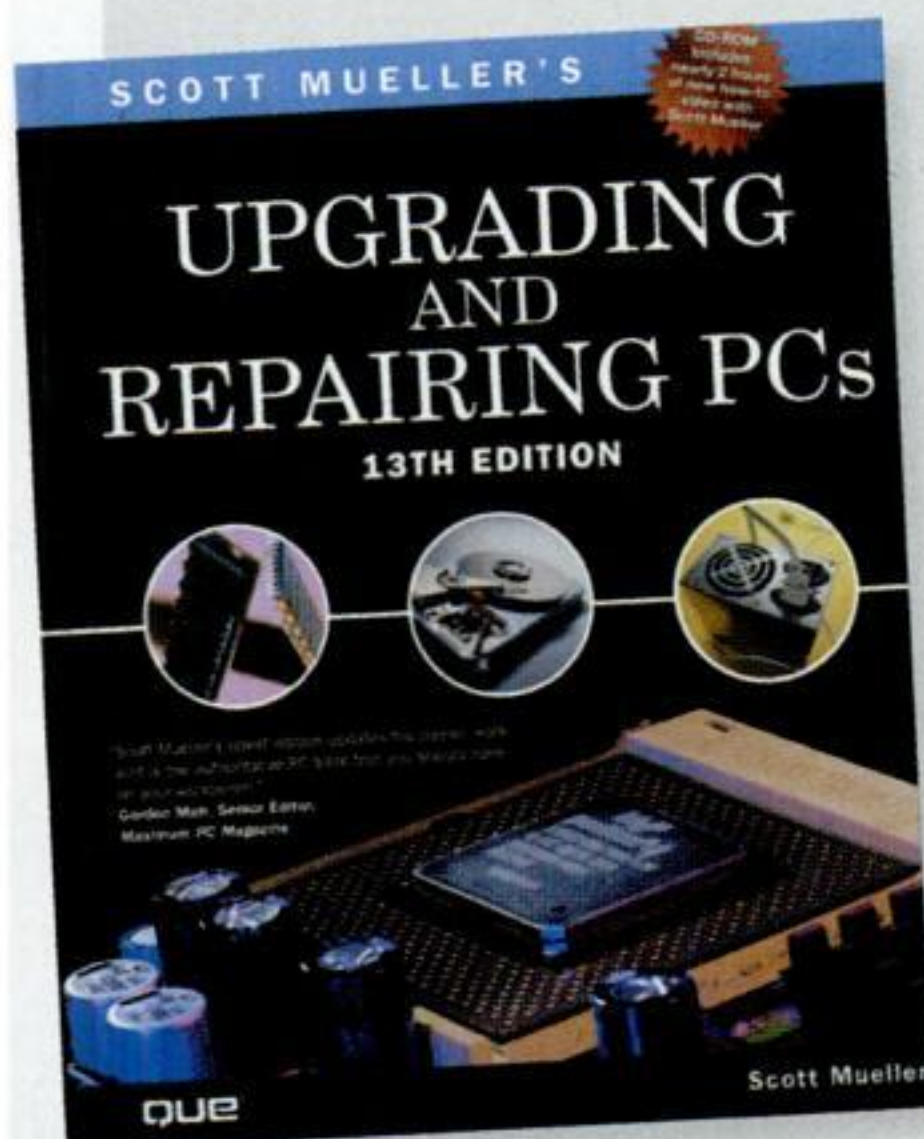
NOTE: In this chart, lower scores are better. The best scores are bolded.

We now agree with the readers who argue that *HD Tach* isn't reliable when it comes to RAID arrays.



Upgrading and Repairing PCs, 13th Edition

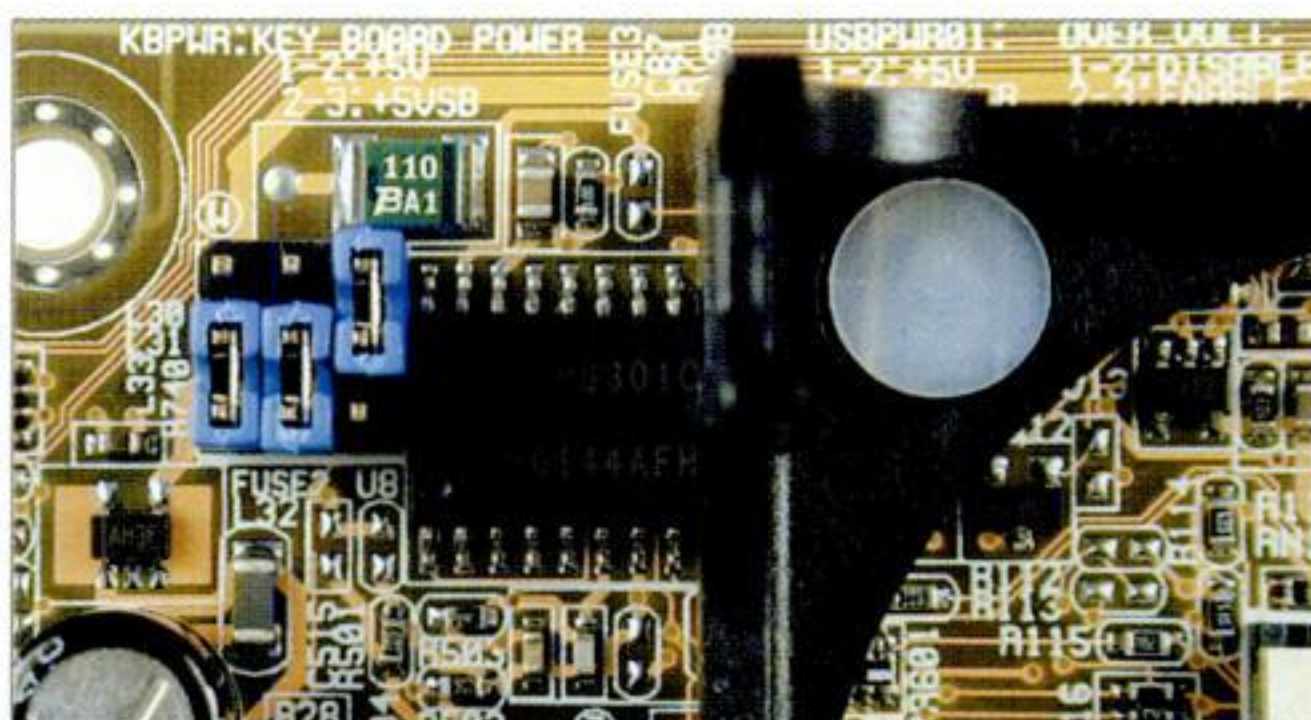
Upgrading and Repairing PCs, 13th Edition is a must-have for even the most hardcore PC mechanic. This update to Scott Mueller's classic work is the authoritative PC bible for newbies looking for a foundation in the basics as well as old-timers who need a full compendium of reference data. We've found that the 1,550-page tome never talks down to readers, regardless of their experience level. The latest edition also includes a CD full of video tutorials (such as one of Mueller swapping out a motherboard), as well as a quote from Gordon Mah Ung on the very front cover. Yes, we like it *that* much! \$45; www.upgradingandrepairingpcs.com



Asus's "Secret" Jumpers

Unlock Your Motherboard's Hidden Mysteries!

Asus's new P4B266 motherboard features a special "hidden" feature for overclocking nuts who want to push their new Northwood Pentium 4s to ever higher speeds. At press time, the highest reported clock speed for an overclocked Nor'wood was hovering in the 3.8GHz range! Will the P4B266 get you there? Probably not without liquid nitrogen. But if you want to overclock your CPU to anything close to that speed, you'll need to ratchet up your stock voltage settings accordingly. The P4B266, which uses Intel's 845 DDR chipset, features an "over-volt" jumper that, when thrown, will let you run the voltage up to 1.75 volts in 0.025 increments. With Willamette CPUs, the switch will let you run voltage up to 2.1 volts. By bumping up the voltage and frontside bus, we were able to crank up a 2.2GHz Northwood to 2.57GHz with basic air cooling. Just for the record, Intel's own pedestrian motherboards don't let you go beyond 1.5 volts for the Northwood. You can go to www.asus.com, but good luck finding any details!



HERE'S YOUR CHANCE TO CONTRIBUTE TO...

Owner Opinions

In the months ahead, the magazine will feature a new section called "Reader Reviews"—this is your chance to report on the pluses and minuses we missed in our own published reviews. Currently, we're looking for reader reviews of the following products:

- ATI Radeon 8500
- Celestix Aries Home Server
- Falcon Mach V desktop PC
- IBM 60GXP hard drive
- PlexWriter 24/10/40

If you own one of these products and would like to contribute, send an e-mail to owneropinions@maximumpc.com. Name the precise name/model number of your gear and include a descriptive, detailed, 300-word review of your most significant likes and dislikes. Include your real name, because *Maximum PC* reviewers don't use pseudonyms!



Honey, I Shrunk the Intern

(...continued from February)

In last month's installment, our "test tube intern" had just come to term. After briefing him on the ways and language of the Lab, we were ready to put the young fellow to work. His maiden project would be helping in the assembly of our "Build It" PC.



In a fit of conniption, Will drops a very important screw into the darkest recesses of the case. It must be rescued! But how?



As we've learned from years of experience, there's no problem that a little time at the drawing board can't solve. Gordon and Logan calculate a course of action.



Before long, our intern was fulfilling his duties in exemplary fashion.

to be continued...

Voodoo F-Class Limited Edition

A polished, super-tuned show car, right out of the box

If you think building a "custom" PC is as easy as dropping a hot motherboard, CPU, and videocard into an expensive case, think again. Voodoo PC's latest machine proves that custom PCs aren't just built—they're crafted. In fact, we're comfortable calling the F-Class a fusion of art and technology. Fashioned out of aluminum, Plexiglas, and chrome, and coated with Silverstone Blue automotive paint, the F-Class puts to shame the rigs of most other custom PC vendors.

Of course, beauty is only Plexiglas deep, but Voodoo didn't disappoint us on the hardware front—this bad boy is stuffed with the world's best. The MSI K7T266 Pro2-RU motherboard comes



options included the Klipsch 5.1 speaker set and Sony's finest 21-inch monitor, the awesome GDM-F520.

All of which leads us to the videocard, the rig's single controversial component. Instead of the de rigueur nVidia GeForce3 Ti 500, Voodoo PC opted for an ATI Radeon 8500. Not just any 8500, mind you, but one with a customized tin-plated copper heatsink and ThermalTake Crystal Orb fan. Voodoo dramatically overclocked the Radeon 8500 to a 300MHz core and 300MHz memory (up from 275MHz/275MHz). Unfortunately, the frequency boosts didn't result in outrageous benchmark improvements. Sure, in our *Quake III Arena* benchmark, the F-Class clocked an impressive 86.3fps, which is a hair faster than the score of the overclocked GeForce3 Ti 500 in the SuperDell reviewed on page 64. But in our *3DMark2001* DirectX 8 pixel-shading test, the F-Class came out about 30 percent slower than the average GeForce3 Ti 500-equipped PC.

with onboard USB 2.0 and is partnered with the fastest Athlon XP CPU available, a 1.67GHz screamer. Our review config also included 512MB of DDR memory, Western Digital's "Special Edition" 1000BB hard drive, a Sound Blaster Audigy soundcard, and a 24x Plextor CD-RW drive. Despite all this power, the F-Class runs as quietly and smoothly as a finely tuned sports car. External

Oddly, the Radeon 8500 spit out an amazing 8,800 in the overall *3DMark2001* benchmark, which is between 500 and 1,000 points better than what we've seen from some Ti 500-based configs. This benchmark quandary left us wondering if the pixel-shader benchmark is simply ATI unfriendly, or if ATI is simply unable to code DirectX 8 drivers as competently



The Voodoo system comes with 5.1 Klipsch speakers.

as its archenemy nVidia. For what it's worth, Voodoo can outfit its PCs with either nVidia or ATI silicon, so if you're wary of the Radeon 8500, you can still get an F-Class without compromising.

In our non-gaming benchmarks, the Voodoo rig turned in top-notch performance, despite the fact that it relies on a single 100GB hard drive instead of a striped RAID 0 array, which is oh-so-trendy among boutique PC vendors these days. Of course, the hard drive in question is Western Digital's 1000BB-SE, which boasts an enormous 8MB cache.

Voodoo's claim to fame is origami-style cabling work, which the F-Class sports in spades. The rig's paint job, however, outshines even the neatly folded cables, not to mention the custom-cut "Eye of

UNDER THE HOOD

THE BRAINS

CPU	AMD Athlon XP 2000+ (1.67GHz)
Motherboard	MSI K7T266 Pro2-RU with USB 2.0
RAM	Two 256MB PC2100 DDR SDRAM
I/O ports	PS/2 keyboard and mouse, four USB 1.1, four USB 2.0, two serial port, one parallel port, video in/out, DVI, VGA, Ethernet, IEEE-1394, game port, mic in, line in, three analog audio out
Open slots	Three

DISPLAY

Videocard	ATI Radeon 8500 with special heatsinks and fan
Display	Sony GDM-F520 (19.8-inch viewable)
Refresh@max res	2048x1536

STORAGE

Hard drive	100GB Western Digital WD1000BB-SE with 8MB cache
DVD-ROM	Pioneer slot fed 16x DVD-ROM
CD-RW	Plextor 24x10x40 CD-R/RW

NETWORKING

LAN	D-Link 538TX 10/100 Ethernet
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SOUND

Soundcard	Sound Blaster Audigy X-Gamer
Speakers	Klipsch 5.1

MOUSE

	Logitech Cordless Freedom optical mouse
--	---

KEYBOARD

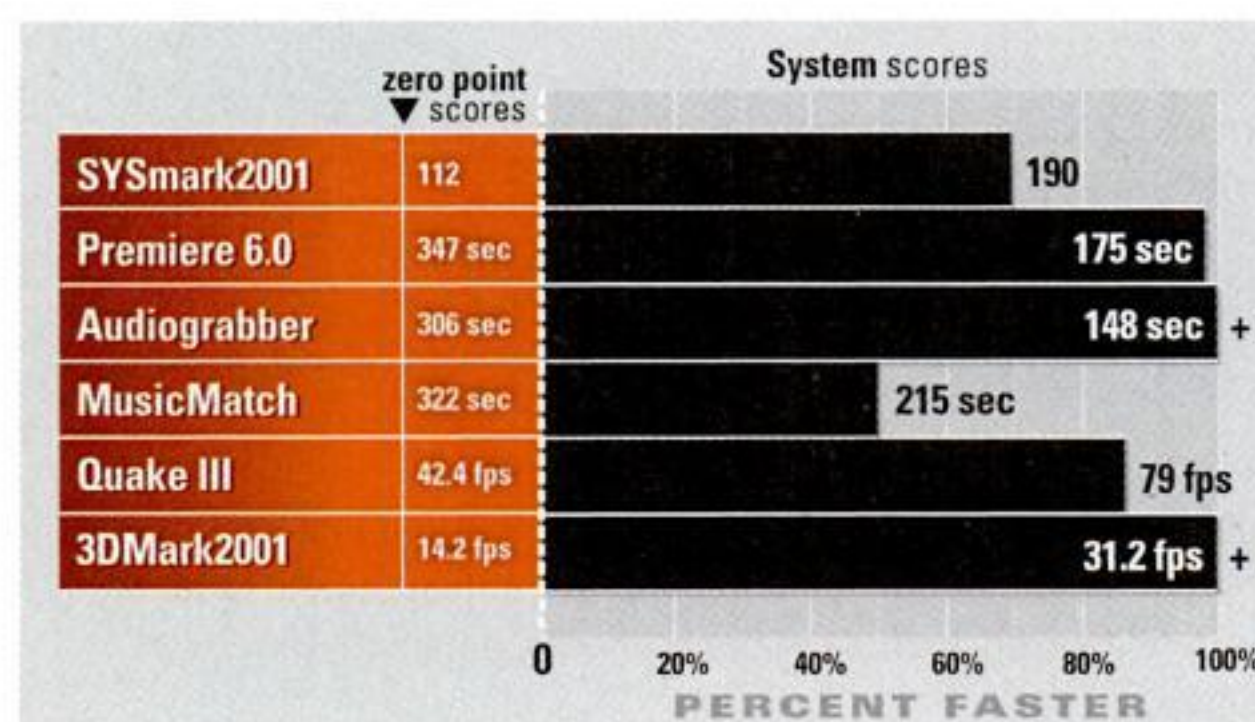
	Logitech Cordless Freedom keyboard
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BUNDLE

	Windows XP Home
--	-----------------

BOOT: 37 sec.

DOWN: 10 sec.

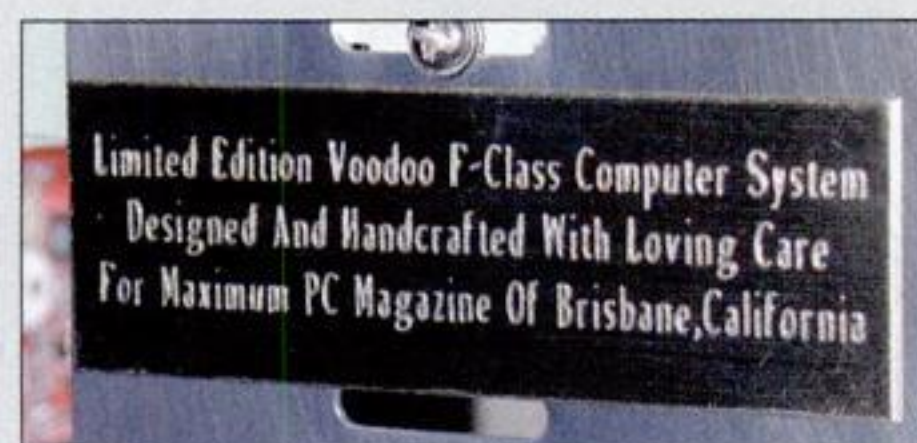


Full benchmarking details in the Mag Reprints section of MaximumPC.com.

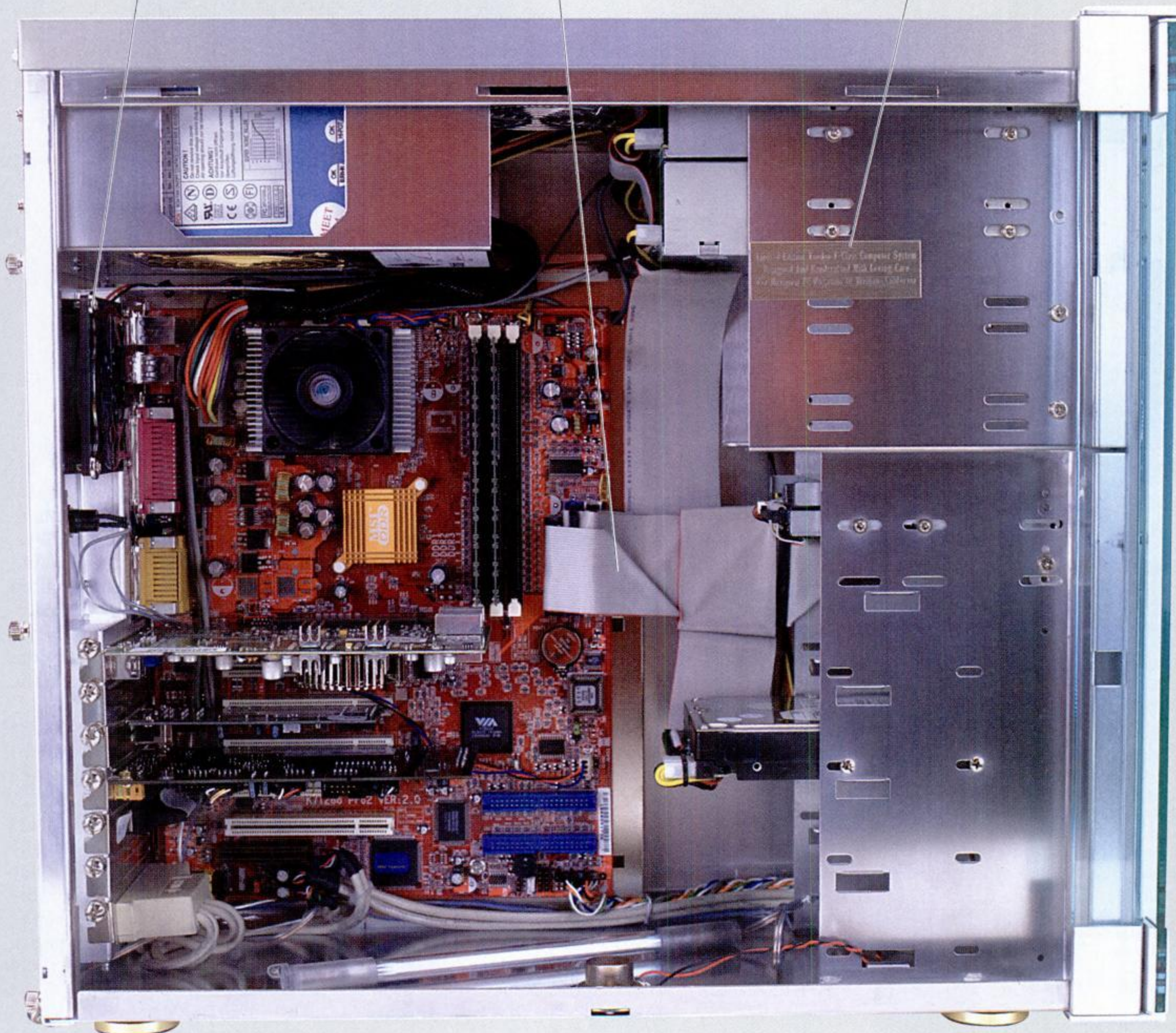


Fan-fare: Check out the attention to craftsmanship exhibited on the fan grill of the F-Class PC.

BMF: Voodoo pioneered the art of folding IDE cables in an aesthetically pleasing manner.



Commissioning plaque: A personalized plate bears the engraved name of the PC's owner and is a hallmark of every F-Class machine.



the Storm II" side window. According to Voodoo, our F-Class is adorned with a European automotive paint that runs about \$400 a quart. The actual paint job involves a primer coat, a pearl coat, and three clear coats, with web-sanding in between each. The effect is stunning and equal to the paint job on a top-of-the-line car. Of course, all this beauty doesn't come cheap. The F-Class—complete with all the visual pomp, customized "dedication plate," Sony monitor, and Klipsch speakers—will set you back a steep \$6,229, shipping inclusive. You can

forgo the monitor and speakers and end up with a cool \$3,900 price tag. That's a pretty penny, but perfection doesn't come cheap.

There are folks who spend every waking moment upgrading, polishing, and primping their project cars for bragging rights. And there are people who just go out and buy a sparkling, tuned-up supercar for instant gratification. The latter would be the F-Class, and you can count on it to deliver.

— GORDON MAH UNG

MAXIMUMPC VERDICT

F-Class Limited Edition
VOODOO PC

+ OFF THE HOOK

Its beauty is mesmerizing, mesmerizing, mesmerizing. Its performance is nearly beyond reproach.

- ON THE HEAP

The jury is still out on ATI's Radeon 8500 drivers.

888.708.6636 www.voodooopc.com

\$6,229 (\$3,900 w/o monitor and speakers)

9

Totally Awesome SuperDell

Lots of speed, little style

Is it possible to name a PC "SuperDell" and not have Michael Dell's lawyers knocking on your door within a nanosecond? Apparently so. Totally Awesome Computer's SuperDell is actually named after Super Dell himself. That would be "Super" Dell Schanze, the company's founder, as well as the bane of Utah airwaves. Around those parts, Super Dell is infamous for his brash, tacky, low-budget advertising spots—which directly contrast with his high-budget yet decidedly understated PCs. You betcha: The SuperDell is the kind of no-nonsense beige box that would have an iMac user screaming for his Pantone color chart. We're loath to validate the aesthetics of the fanatical Apple hordes, but we would've liked to have seen a dash of flair somewhere in the SuperDell. And what's up with the chaotic wiring job? We haven't seen

a rat's nest like this since Phillips came in with his hair unwashed.

Internally, the SuperDell is pretty much top-of-the-line AMD, sporting an Athlon XP 1900+ (that's 1.6GHz for those of you who don't buy into AMD's confusing naming convention) and 512MB of PC2100 DDR memory. The CPU is fitted to an Asus A7V266-E

motherboard that uses the favored VIA KT266A chipset. A Promise RAID controller is soldered to the motherboard and serves a pair of 60GXP IBM Deskstar drives in a striped RAID 0 configuration. Sadly, the two 40GB drives are a tad small by today's standards. An OEM Sound Blaster Audigy soundcard and a Gainward GeForce3 Ti 550 top off the bundle.

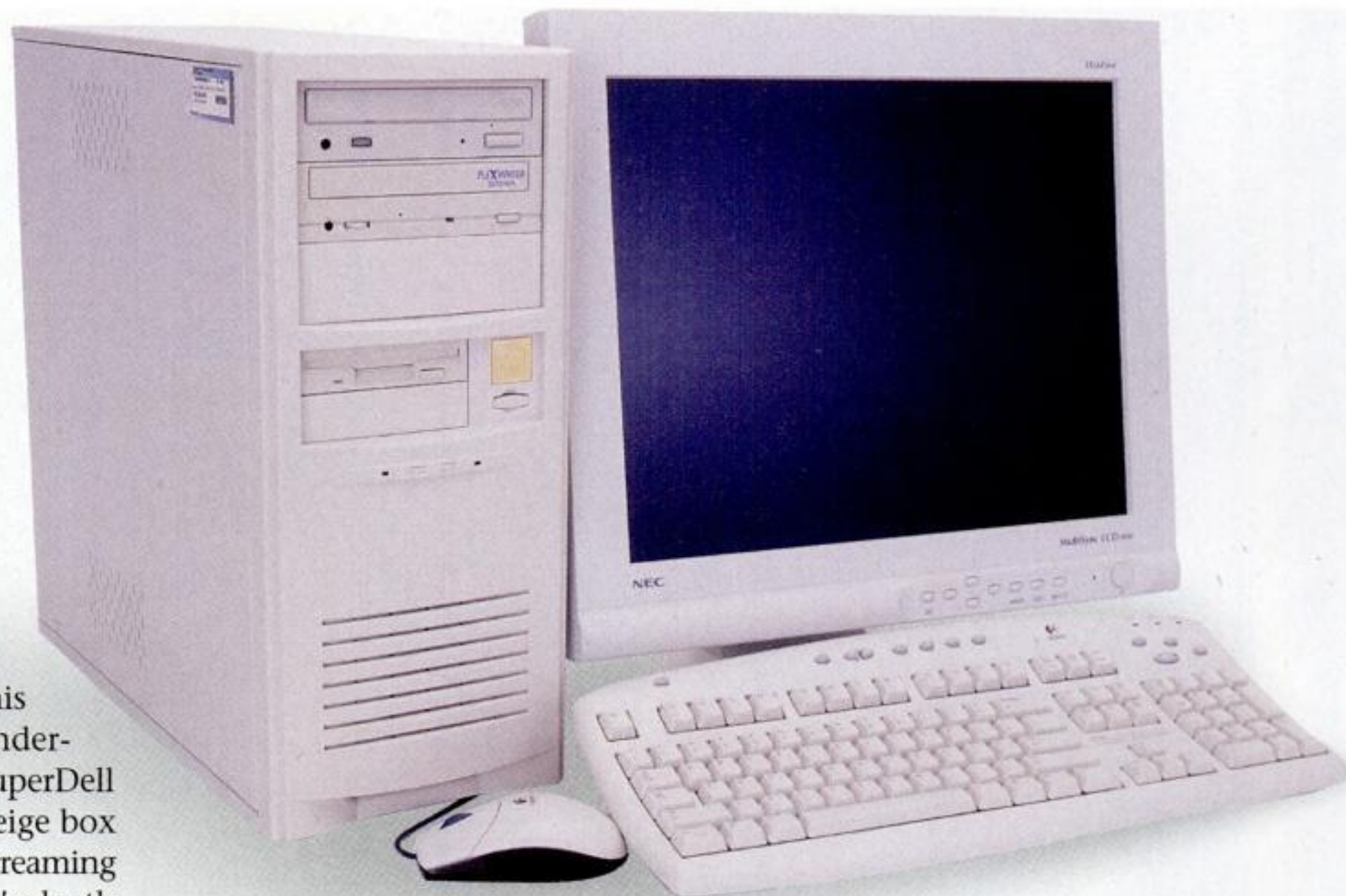
That "Ti 550" designation caught your attention, didn't it? You should know that it's not a secret nVidia chipset, but rather just a piece of clever marketing on Gainward's part. The GeForce3 Ti 550 is actually a slightly overclocked GeForce3 Ti 500 chip partnered with slightly faster memory. Gainward bumped the card's core speed from 240MHz to 249MHz and the memory from 250MHz to 272MHz DDR.

This isn't the first time Gainward has played reindeer games. In fact, nVidia officials told us that two years ago,

Gainward released to the press an nVidia-based videocard that featured memory that was available only as samples—nVidia was troubled by the resulting confusion. This time, it seems Gainward has been able to overclock enough videocards to sell the Ti 550 as a standard option to consumers. For what it's worth, Totally Awesome is warranting the overclocked Gainward card.

In the monitor department, Totally Awesome shipped us a beautiful 18-inch NEC 1830 flat panel. This 1280x1024 monitor has dual VGA inputs, but no DVI. At first we balked at the absence of DVI, but, in fact, the NEC exhibits a rock-steady display that makes us believe the claim that new analog-only flat panels have almost caught up with their digital cousins. In fact, only one *DisplayMate* test could evoke any video noise.

The SuperDell's benchmark performance was excellent, and its speed in our DirectX 8 pixel-shading benchmark, *3DMark2001* Game 4, was second only to that of the overclocked Element PC we reviewed in February. The rig's performance in *SYSMark2001*, which measures how fast a PC can perform tasks in 14 different applications, was also top-shelf with a score of 188—not record-breaking, but pretty damn respectable. The SuperDell also turned in a respectable score in our Adobe *Premiere 6.0* test, which gauges how long a PC takes to render a small video project



UNDER THE HOOD

THE BRAINS

CPU	AMD Athlon XP 1900+ (1.6GHz)
Motherboard	ASUS A7V266-E
RAM	Two 256MB PC2100
I/O Ports	PS/2 Mouse and keyboard, four USB, two serial, one parallel, one game port, fast Ethernet, IEEE-1394, mic in, line in, three analog audio out
Open Slots	Two 32-bit PCI

DISPLAY

Videocard	Gainward GeForce3 Ti 550
Display	NEC 1830 LCD (18.1 inch viewable)
Max res	1280x1024

STORAGE

Hard drive	40GB IBM 60GXP Deskstar (two in RAID 0)
DVD-ROM	Pioneer 16x DVD-ROM
CD-RW	Plextor 24x10x40 CD-R/RW

NETWORKING

LAN	3Com Ethernet card
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SOUND

Soundcard	Sound Blaster Audigy
Speakers	Klipsch 5.1

MOUSE

	Logitech Optical mouse
--	------------------------

KEYBOARD

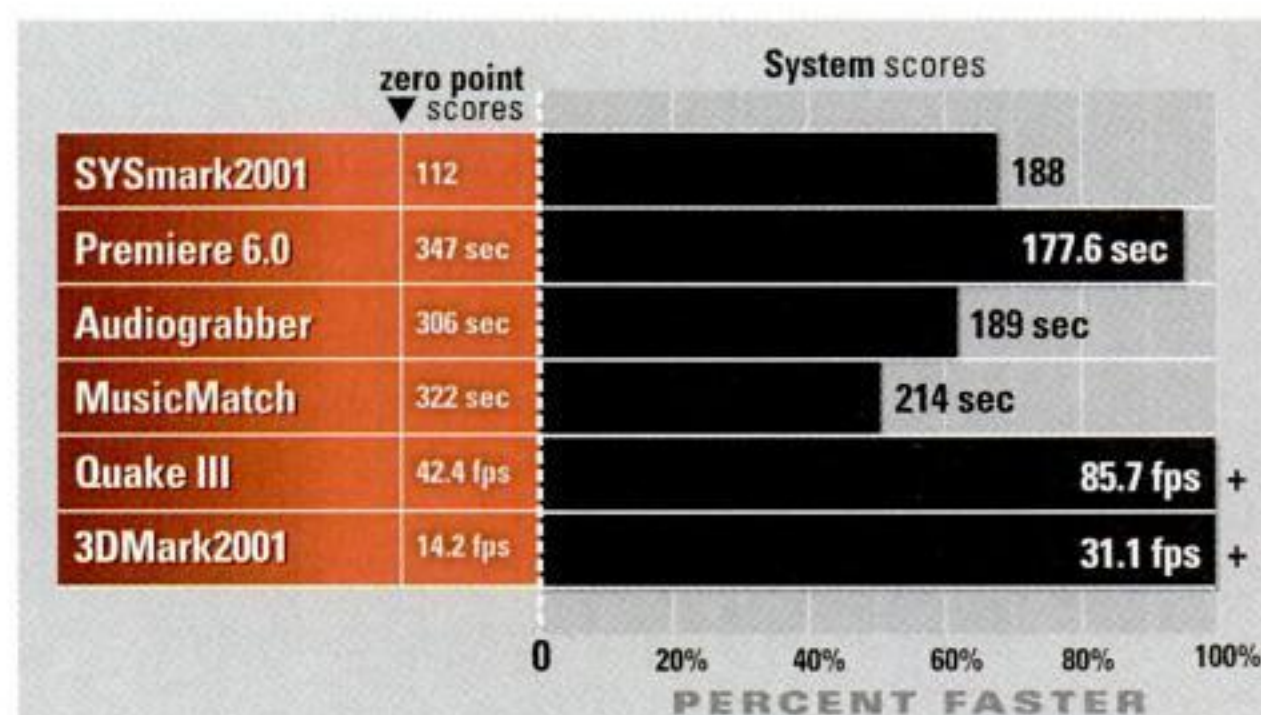
	Logitech Internet keyboard
--	----------------------------

BUNDLE

	Microsoft Windows XP Home
--	---------------------------

BOOT: 67 sec.

DOWN: 7 sec.



Full benchmarking details in the Mag Reprints section of MaximumPC.com.

Looking ahead: The CPU isn't overclocked, but the ThermalTake Volcano 6 Cu+ gives you a little headroom down the road.

Speakeasy: The Klipsch 5.1 speakers must grow on trees because everyone's got 'em—though not quite at the low, low price that TA charges.

Cool and collected: The cabling may not be that orderly, but there is sufficient air flowing throughout the case. Some kind of cooling on the hard drives would have been nice, though.



**Totally
AWESOME
Computers**



to Windows Media format.

The SuperDell's most sparkling feature isn't its performance or parts configuration, however. It's the warranty. Totally Awesome Computers says it offers life-time service and support for its PCs and a three-year warranty on hardware. "We cover everything except physical damage to the system," the company boasts.

And we think that's just super.

—GORDON MAH UNG

MAXIMUMPC VERDICT

SUPERDELL
TOTALLY AWESOME COMPUTERS

+ DELL-ICIOUS

Great performance, a "life-time service" contract, and a plumb-crazy price.

- DELL-ETERIOUS

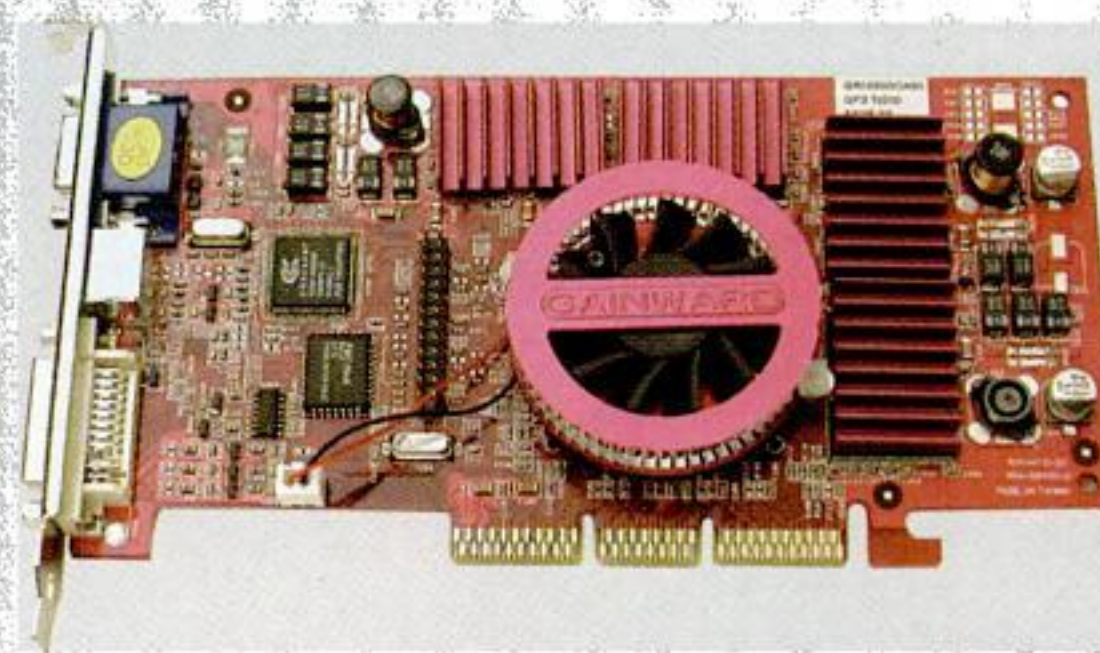
Bland as the vanilla pudding they used to serve in the mess tent at the 4077th.

888.965.8844 www.totallyawesome.com

\$3,100 (\$2,000 w/o monitor and speakers)

8

Red rum: The Gainward GeForce3 "550" is a pretty little bastard and comes pre-overclocked for your viewing pleasure.



Sony DVD+RW/CD-RW

Putting the "plus" in +RW



We were underwhelmed by the first DVD+RW drive we received (HP's dvd100i, February 2002). In fact, considering how long the technology took to reach fruition, things looked pretty bleak for the +RW standard as a whole, especially when compared to Pioneer's DVD-RW format. But with the introduction of Sony's DRU110A DVD/CD burner, things are finally looking up for the fledgling standard. Not only does Sony's drive offer higher compatibility than HP's dvd100i, but the Sony DVD+RW/CD-RW is one of the first combo drives we've tested that doesn't immediately scream "compromise."

Our first take on the Sony drive was disappointing: Writing 4.25GB of data to a Sony +RW disc took 37:07, compared with 31:18 for the HP dvd100i. As

THE BUNDLE

B's Recorder Gold, *B's Clip* (packet-writing software), *Sonic MyDVD 3.0*, *WinDVD*

both the dvd100i and DRU110A drives use Ricoh's internal hardware, we suspected that the bundled software—*B's Recorder Gold*—was

the culprit. The name *B's Recorder* may not ring a bell for most people, but it's actually fairly serious disc-mastering software that rivals *Ahead Nero* in many ways. It's just as easy to use as *Nero* or *Roxio Easy CD Creator*, but it also offers a raft of extras, such as automated AutoPlay CD creation and direct-to-CD recording from analog sources, so you can archive all those old funky records. What it lacks, however, are the extended audio CD filters included with *Nero*, and its burn times are significantly longer. We tried the 4.25GB data burn using *Nero 5.5.6.4* and completed the recording in 31:51.

Surprisingly, the Sony's CD-R performance under *B's Recorder Gold* was above average compared with the performance of dedicated 12x CD-RW burners—an impressive feat for a com-

Sony—one of the original architects of the DVD+RW format—just kicked the recordable DVD standards war into high gear.

bination drive. In digital audio extraction, the DRU110A didn't break any speed records, but, again, it performed a little better than we expected from a combo drive, extracting 75:27 in 6:58 minutes without errors (though the drive did seem to struggle a bit at the outer edges, pausing intermittently throughout the end of the last track).

But the best thing about the Sony DVD writer is that, compared to the HP DVD+RW, it produces discs that are compatible with a greater number of set-top DVD decks and PC-based DVD-ROM drives. The superior compatibility appears to be a result of slightly buffed-up firmware and higher-quality media. It's hard to imagine a bigger buzz-kill than spending \$600 on a DVD recorder, only to find that your homemade discs won't play on your set-top player. Sony brings DVD+RW a step closer to the compatibility currently offered by Pioneer's DVD-RW DVR-A03, but ultimately fails to prove itself as a superior technology. And the lack of rudimentary write-once capability—which is available in the DVD-R spec and offers even higher compatibility rates—is a big disappointment. So we can't give this fine drive anything higher than an 8.

Superior technology doesn't always rise to the top in the strange evolutionary ladder of consumer hardware standards (remember "Betamax"?). Regardless, if DVD+RW takes over the world like its backers keep promising, we'd prefer to have Sony's iteration of it. It trumps HP's at this point in time.

It bears repeating that, no, you're not going to be able to copy commercial DVDs with Sony's drive. That is, unless you want to decrypt the video stream, decompress it to your hard drive, recompress it to another video stream, and burn it to a \$15 disc when you could just buy the movie (and probably for less money).

—LOGAN DECKER

MAXIMUMPC VERDICT

DRU110A/C1 DVD+RW/CD-RW
SONY

+ FIRST CLASS

For a +RW drive, it offers the highest level of compatibility with set-top devices and DVD-ROM drives.

- STEERAGE

But it's still not as compatible as Pioneer's DVR-A03 -RW drive.

877.865.7669 www.sonymstyle.com

\$550

8

BENCHMARKS

	DVD	CD
Average data transfer	7.20 MB/sec	3.62 MB/sec
Random/full-stroke seek (ms)	129/273	104/219
Audio extraction (min:sec)	-	6:58
Data burn (min:sec)	37:07	6:49
CPU utilization	21% (2x)	50% (8x)

NOTE: The data CD burn benchmark uses the bundled applications to create a 647MB CD. The data DVD burn benchmark uses the bundled applications to create a 4.25GB DVD. For more information on how we benchmark optical drives, go to the Benchmarking Guide in the Reprints section of MaximumPC.com.

DARE TO COMPARE

	dvd100i (+RW)	Pioneer A03 (-RW)	Sony DVD+RW
Toshiba MD-1502	No	Yes	Yes
NEC DV5500A	No	Yes	No
Pioneer 115	Yes	Yes	Yes
Hitachi GD7500	Yes	Yes	Yes
Samsung SN308	No	Yes	No
NEC DV5800A	Yes	No	Yes
RCA Divx RC52312 (set top)	No	Yes	Yes
Sony RMSS300 (set top)	Yes	Yes	Yes
Panasonic DVD-RV30 (set top)	No	Yes	No

This chart shows whether a DVD created with Sony's drive was able to play in various PC DVD-ROM drives and set-top players. We compared the Sony's compatibility to that of two of its competitors, always using media supplied by the drive manufacturers. "Yes" indicates full compatibility.

All-in-Wonder Radeon 8500 DV

Jack of all trades, master of some

Imagine the ultimate videocard. It would be anchored by the fastest 3D accelerator available and include a TV tuner, a remote control, analog and digital video capture, personal video recorder functionality (à la TiVo), and a scheduling service to help you pick out TV shows to record—all in one convenient, inexpensive bundle. While the new ATI All-in-Wonder Radeon 8500 DV aspires to such greatness, it falls just short of the mark where it counts.

Granted, the latest iteration of the All-in-Wonder boasts the most impressive technical chops we've ever seen in the product's lengthy and venerated lineage. It also represents several firsts: It's the first pure videocard to include integrated FireWire ports. It's the first shipping videocard to boast a "TV tuner on a chip." It's the first videocard with PVR functionality to include a radio-based remote control, and it's the first "do-everything" videocard to include DirectX 8 programmable shaders. But, unfortunately, a few minor problems—along with one big glitch—were enough to sour our opinion of an otherwise worthwhile upgrade.

For starters, the poor performance of the mouse integrated into the remote control is definitely an annoyance. When using default mouse speeds, its cursor is unresponsive to the point of frustration. Unfortunately, in order to increase the speed of the remote's mouse, you have to jack up your main mouse's speed as well, which is entirely unacceptable. We also found that the video-capture quality of ATI's Rage Theater chip is slightly below that of the Matrox Marvel and nVidia Personal Cinema (the All-in-Wonder's main competitors).

But the chimichanga really hit the fan during benchmarking: When the new All-in-Wonder is running in a system using the Intel 850 chipset and more than 512MB of RAM, 3D performance drops to abysmal lows. In this hardware configuration, we received an average of 12fps in *3DMark2001* Game 2, and just 3fps in our *Quake III* test. From what we can tell, this bug affects only the 850 chipset; our Athlon test systems were unaffected. For a gaming machine, in which 512MB might be considered extreme, this would be a minor problem and would likely affect just a small number of users. But for a video editing station, in which massive amounts of memory are the norm, the frame rate plummet is simply unacceptable.

ATI is aware of the problem and should have a fix available on its web site by the time you read this. We were provided with a beta patch that did manage to fix the problem.

Aside from its weaknesses, the card does a lot of things right. The aforementioned mouse, while plagued with slow response, is a great addition to the bundled RF remote. Because it allows you to execute simple Windows tasks all by its lonesome, you could conceivably ditch your PC mouse and keyboard entirely when using the All-in-Wonder for television

ATI's remote control gives you mouse control from your living room perch. Unfortunately, the mouse moves at a snail's pace. This wouldn't be such an impediment if it weren't difficult to use the ATI software without a mouse.



The All-in-Wonder Radeon 8500 DV includes the first "TV tuner on a chip" that we've seen outside of 3dfx's test labs. The chip (underneath the metal shielding) gets really hot, but changing channels is instantaneous.

playback in your living room. The remote control will come in even handier when ATI releases its forthcoming HDTV output converter: You'll be able to feed HDTV signals from your PC directly to your HDTV display, letting you play PC games, surf the web, watch DVD in progressive mode, and even view regular TV on a massive, high-resolution screen.

ATI's personal video recorder (PVR) software is also much improved this go-round. The Multimedia Center, as it's called, is actually a very usable app for TV viewing, TV time shifting, and DVD playback. It's still not as easy to use as TiVo's software because you have to use a mouse of some sort for most navigation, but it's a definite improvement over previous versions, and is comparable to the *InterVideo* software that's bundled with nVidia Personal Cinema cards.

Thanks to its R200 chip, which is virtually identical to the chip that powers the Radeon 8500 but runs at a lower clock speed, this latest All-in-Wonder can do all the pixel and vertex shader tricks that its big brother can pull off. But, sadly, the card's performance is hindered by gimpy 190MHz memory. This denies the All-in-Wonder Radeon 8500 industry-standard frame rate performance, but the card is still more than sufficient for all but the most demanding gamers.

Overall, the ATI All-in-Wonder Radeon 8500 DV is a great bundle of power and features. While it does only a few things better than the competition, it's still got great 3D power and near-endless video-manipulation features. Now, if only ATI could get its driver issues worked out by the time products initially ship.

—WILL SMITH

BENCHMARKS

Quake3 MPC demo	59.6 fps
3DMark 2001 Game 2 High detail	46.9fps
3DMark 2001 Game 4	12.0fps

NOTE: The benchmarks above were run on our standard 1.3GHz P4 testbeds (which include 256MB of memory) using the 6.13.10.3286 drivers from ATI's web site.

THE SPECS

Core	230MHz R200
Memory	190MHz DDR SDRAM
Inputs	S-Video, 1394 (FireWire), RCA Video + Audio, RF
Outputs	1394 (FireWire), S-Video, RCA Video + Audio
Max res	2048x1536@85Hz

MAXIMUMPC VERDICT

Radeon 8500 DV
ATI TECHNOLOGIES

+ KODOS

A radio remote, great PVR features, awesome DVD playback, and programmable shader support make this the best All-in-Wonder ever.

- KANG

Slow memory hinders performance, the mouse on the remote is wonky, and video-capture quality is less than perfect. And then there's the Intel chipset bug.

905.882.2600 www.ati.com

\$400

8

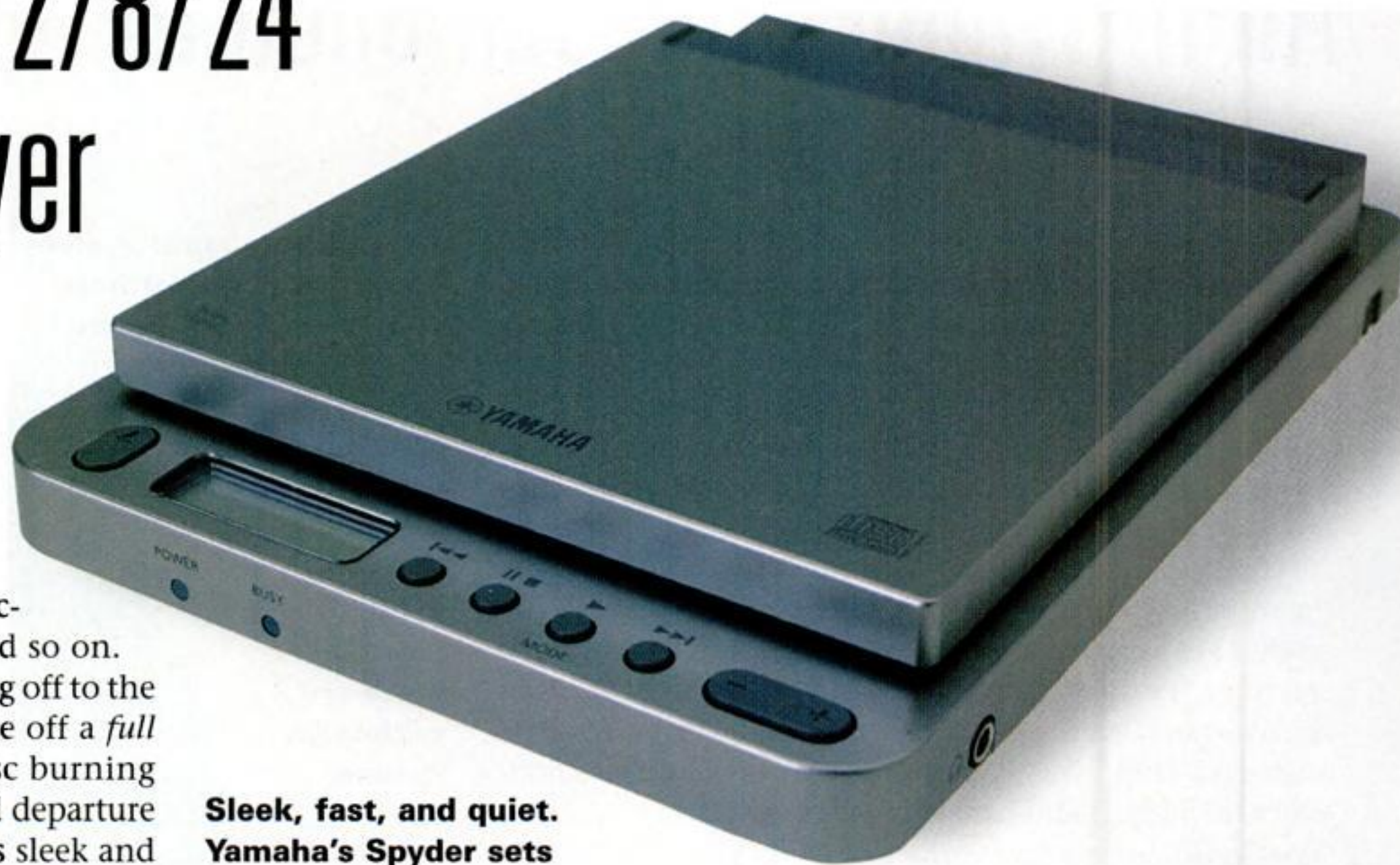
Yamaha Spyder 12/8/24 CD-RW/MP3 Player

CD burning on the half-shell

Yamaha has been dutifully cranking out CD burners with higher and higher performance ratings in step with all the other manufacturers—20x, 24x, 32x, and so on. But just as we were nodding off to the lullaby of how we'd shave off a *full nine seconds* from our disc burning tasks, Yamaha took a bold departure from the ordinary with its sleek and portable Spyder CD burner/MP3 player. Consider us shaken.

External burners typically resemble cinder blocks with power plugs. But not the Spyder. It weighs in at about 1.5 lbs. and looks fantastic without that "trying-too-hard appearance" of other slimline externals. The Spyder features built-in MP3 playback hardware (with support for bitrates up to 192Kbps), so you can listen to your 150-song compilation CDs via the line-out jack—all without attaching the drive to a PC. These features, combined with a 12x writing speed and a USB 2.0 connection, put the Spyder far ahead of similar models from LaCie and even Plextor.

A 12x recording rating may not sound glamorous anymore, what with the emergence of internal drives that write three-times as fast, but at 7:28 minutes for a 647MB disc burn, the Yamaha Spyder is still about 2.5 minutes faster than LaCie's 8x PocketDrive CDRW. And compared to six internal drives we tested, the Spyder's 647MB burns lagged by only around 40 seconds. The big sur-



Sleek, fast, and quiet.
Yamaha's Spyder sets
a new standard in
optical-drive urban chic.

prise was the Spyder's CD-RW read performance, which was faster than its CD-R read performance! This is particularly good news for a CD/MP3 player, where CD-RWs make great media for compilation discs (you can continually rewrite the discs with updated mixes).

The whisper-quiet Spyder is also distinguished from the competition by its "partial-CAV" writing method. This writing strategy rotates the disc at a variable rate during the initial phase of a burn, then segues to a constant rate as the laser sweeps across the disc to the larger outer rings. This is in contrast to the "Zone-CAV" method (used by TDK and Plextor, among others), which separates the surface of the disc into three separate speed zones. In order to switch speeds between the Zone-CAV zones, the writing process must be paused, creating a small gap. The theoretical advantage to partial-CAV is that the writing process is never stalled, thus gaps aren't created. Does this matter to the average Joe? Probably not. But extremely high-strung types will appreciate the Spyder's continuous recording method, along with its spacious 8MB buffer, buffer underrun protection, and a "pure-phase laser system," which allegedly reduces jitter rates.

The Spyder's audio extraction tested a bit on the slow side, which isn't unusual for devices that stream so much data through external buses, but each track came out perfectly ripped with no clicks or pops.

The only things holding the Spyder

from a Kick-Ass award are its ineffective menuing system and lack of ID3 tag support. Navigating an MP3 CD on the Spyder can be a nightmare, as all tracks and folders (which can be nested up to eight levels deep and contain up to 300 tracks each) carry no identification other than a number. We're also disappointed that the Spyder doesn't offer any battery power options, which would have increased portability and overall usefulness.

The Yamaha Spyder isn't the perfect optical drive for speed freaks, but it's the fastest drive we've seen in the fly-weight category. And with built-in MP3 playback, the Spyder is a tough combination to beat.

—LOGAN DECKER

BENCHMARKS

Average data transfer (MB/sec)	2.68
Average drive rating	18.31x
Random/full-stroke seek (ms)	168/201
Audio extraction (min:sec)	6.44
Data CD burn (min:sec)	7:28
CPU utilization (at 8x)	12%

Note: The audio extraction test rips music from a commercially stamped 75:27 minute audio CD. The data-CD burn test uses the bundled applications to create a 647MB CD-R. For more information on how we benchmark optical drives, see the Mag Reprints section of MaximumPC.com.

THE BUNDLE

Ahead Nero Burning ROM, MusicMatch Jukebox, Adobe PhotoDeluxe, Adobe Photoshop LE, Adobe ActiveShare

MAXIMUMPC VERDICT

Spyder 12/8/24 CD-RW/MP3 Player
YAMAHA

+ CHEERY

Don't knock the 12x write speeds—they're the fastest you can get in an external drive at this weight. The Spyder also offers MP3 playback and a backward-compatible USB 2.0 connection to boot.

- WEARY

The navigation scheme bites, and we like to see battery power in all portable MP3 devices.

714.522.9011 www.yamaha.com

\$300

8

Itronix Go Book MAX

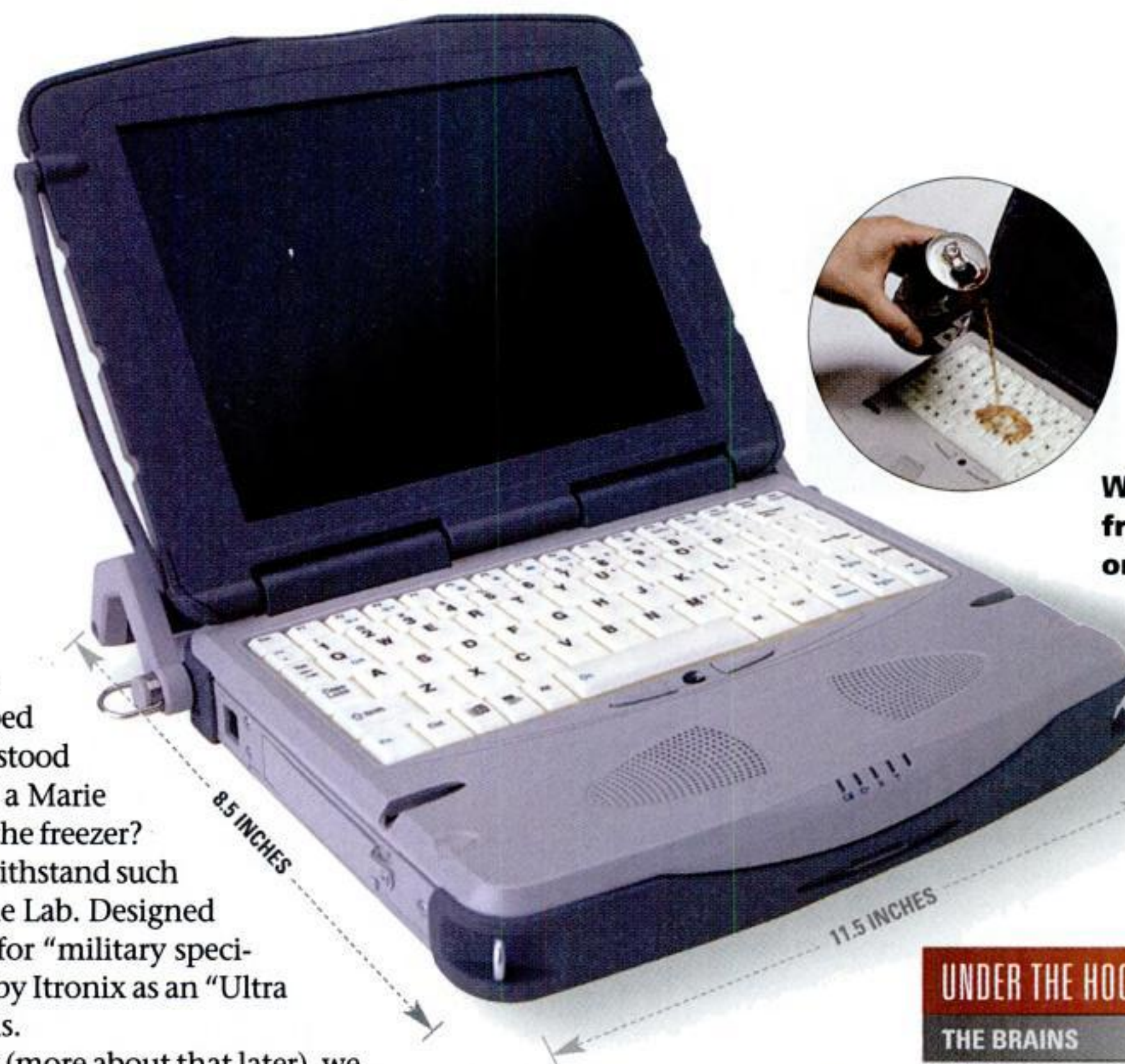
Tougher than a junkyard dog

Last month we looked at the Dell Inspiron 8100, the fastest gaming notebook in town. But what if you dropped it? Or spilled a soda on it? Or accidentally stood on top of it? Or somehow mistook it for a Marie Callendar Turkey Pot Pie and tossed it in the freezer? We've never seen a notebook that could withstand such abuse until Itronix's Go Book Max hit the Lab. Designed to exceed current Milspec (that's jargon for "military specification"), the Go Book MAX is classified by Itronix as an "Ultra Rugged" notebook—and ultra rugged it is.

After we finished all our benchmarking (more about that later), we moved on to Phase II of Operation Destroy Notebook. First up was the "Dr Pepper Challenge"—a full six ounces was poured onto the keyboard to simulate the accidental spillage that occurs in times of crisis. We then splashed hot water on the soda spill for about five minutes, just like you'd do under wartime conditions. Result? The keyboard worked fine. Sure the "L" key was a bit sticky, but it was already sticking when we received the unit.

Next up was the "Stout Editor Test." We set the Itronix on the floor with the lid opened to form an A-frame, then had one of our 195-pound editors stand directly on top of the notebook's hinge. We repeated the test 10 times—and the notebook never collapsed. Nor did the Itronix suffer any problems in the "Desktop Drop Zone." This challenge recreates what happens when a loved one walks into the room, sees you playing that MUD yet again, then knocks your notebook to the floor in one big, dramatic, desk-clearing sweep. Well, we drop-tested the Itronix a number of times from heights between 30 and 50 inches, but no amount of free-falling could either damage the notebook's body or stop the computer from working properly. We even dropped the Itronix with its screen open and the system powered up, but nothing could shake it.

For our final test, the "Deep Freeze Double Dare," we stuffed the Itronix in our freezer until its external temperature read 17 degrees Fahrenheit—cold enough to freeze the water left behind from the Dr Pepper flushing. The notebook functioned fine. Bottom line: This sucker should be able to withstand any abuse you can dish out. The hard drive, while only 20GB, is housed in a shock-absorbing chamber. And while this Itronix isn't certified as "waterproof," we're sure it could easily withstand a



We beat it, froze it, stood on it, and doused it with the Pepper. Still, the Go Book MAX survived.

drenching from a rainstorm. The notebook also features a touch-sensitive screen that's fairly resistant to fingers; push as hard as we did on a standard LCD, and you'd risk breaking it.

While the notebook is tough enough for Leroy Brown, its benchmarks were subpar. With just a 700MHz Pentium III, it pulled in numbers that trailed our zero-point reference notebook, a Micron Transport GX+. Now, of course, the Micron is a desktop replacement notebook, whereas the Itronix is designed for use in steel factories, battlefield headquarters, and cross-country trips in a Winnebago. Nonetheless, we couldn't even run our battery life test, *SYSmark2001*, or *Quake III*.

Of course, mentioning these dings is like ripping into a Humvee for having a rough ride or running slow quarter-mile marks. Most people will never put this notebook through the gauntlet of extremes it's built to weather. But if you're a reporter e-mailing stories from Tora Bora, a hard hat fine-tuning the disaster-response system at the local sewage treatment plant, or a teenager who's prone to spilling his bong water, the Itronix might be your answer. Sure, you could buy two or three lesser notebooks for the price of the Go Book Max, but if you're particularly rough on your equipment, you'd probably end up buying that many notebooks anyhow.

—GORDON MAH UNG

UNDER THE HOOD

THE BRAINS

CPU	Intel Mobile 700MHz Pentium III (Coppermine)
RAM	256MB PC100 SDRAM
I/O ports	Single CardBus PCMCIA, two USB 1.1, Fast Ethernet, VGA out, serial

NETWORKING

Modem	Lucent WinModem
LAN	Intel Pro/100+ Mini PCI Internal Sierra Wireless AirCard 300 CDPD

DISPLAY

Video	Silicon Motion LynxEM+
Display	10.1-inch touchscreen (800x600)

STORAGE

Hard drive	20GB IBM Travelstar (4200rpm)
CD-RW	External Teac CD-210PU USB CD-ROM

SOUND

Audio chip	ESS Allegro
-------------------	-------------

WEIGHT

Lap weight	7.3 lbs
Carry weight	8.1 lbs

BUNDLE

Windows 98 Second Edition

BOOT: 24.1 sec. **DOWN: 5 sec.**

MAXIMUMPC VERDICT

Go Book MAX
ITRONIX

+ YEAS

If attacked, you could beat the assailant to a pulp with the Itronix, then promptly send an e-mail to the authorities, explaining what happened.

- NAYS

The notebook is under-powered and under-featured across the board, and its 800x600 screen is just too small.

800.441.1309 www.itronix.com

\$6,000

8

	zero point scores	System scores
SYSmark2001	87	WNR
Premiere 6.0	334 sec	393 sec (-15.0%)
Photoshop 6.0	220 sec	229 sec (-3.9%)
Audio Extraction	480 sec	1088 sec (-55%)
Quake III	17 fps	WNR
Battery life	125 min	WNR

0 20% 40% 60% 80% 100%
PERCENT FASTER

Full benchmarking details in the Mag Reprints section of MaximumPC.com

4.1 Firestorm

More expensive isn't always better when it comes to 4.1 speaker rigs

Speakers need to do only two things as far as we're concerned; everything else is secondary. If they can accurately reproduce sound, and do so at high volumes, then they're OK in our book. Good speaker wires, a pleasing aesthetic design, and a useful control pod with a power switch, volume control, bass and treble knobs, and headphone output are just welcome extras. Luckily, both of these 4.1 rigs, the THX-certified Logitech Z-560 and the Altec Lansing 641, are perfect for quad-speaker gaming and meet our basic criteria. The difference between the two lies in their details.

Altec Lansing 641

The Altec Lansing set uses traditional satellites to produce massive volumes of crisp, clear sound at most frequencies. When playing a shooter like *Medal of Honor*, the 641 system reproduces the sound of bullets whizzing past and mortars exploding all around.

Each of the 641's four satellites feature a Mylar tweeter and a 3-inch driver. They accurately reproduce midrange and high-frequency sound, and reach volumes that will collapse your eardrums. But, the really interesting thing about the 641's design is the subwoofer. Instead of using a single large speaker and a bass-enhancing enclosure—like most traditional subs—the 641 set employs two smaller 6-inch speakers in a vertical dual-ported enclosure. While this produces adequate bass, we noticed a little more port noise and bass rattle than we like to hear when



Damn! That's one big subwoofer! Sadly, it's loud in all the wrong ways.



Logitech's Z-560 set really spansks the monkey's ass. Great sound and massive volume put these speaks in the same class as the Klipsch.

we played sub-200Hz frequencies at a high volume.

The control setup for the 641 set is exactly what we like to see. Digital controls for power, volume, bass, treble, and speaker mode (stereo, stereo x2, and 4.1 gaming) are all easily accessible on the wired remote. If you frequently use headphones or auxiliary inputs, the 641 has you covered, with a headphone jack on the remote and a second input on the front of the sub, near the top.

Although the Altec Lansing system produces decent sound, when we A/B'd the 641's speakers with other speaker rigs, their performance was less than perfect at low frequencies. Low frequencies at high volume shouldn't produce noticeable bass rattle in a subwoofer. It's also worth noting that the 641 doesn't allow audiophiles to replace the craptacular cables that ship with the system, as they are permanently attached to the speakers.

Logitech Z-560

The Kick-Ass Logitech Z-560 system employs a novel satellite design to great effect. In lieu of separate midrange and tweeter drivers, the Z-560's satellites use a single 3-inch driver. The interesting thing about the satellites is the metal cone at the center of the speaker, which is used instead of a traditional dustcap. In addition to protecting the delicate innards of the speaker, the metal cone helps focus the sound, resulting in a very tight active sound field. The subwoofer uses a single 8-inch speaker, which fires out crisp, clear bass. We're also amazed at the clarity of these speakers. Our 20Hz-to-20KHz sweep is brutal on most speakers at maximum volume, but the Z-560's speakers handled it without any notice-

able distortion. In fact, at maximum volume, the Logitech speakers caused the screws on neighboring Lab benches to vibrate, but we weren't able to detect any infidelity in the sound. It's worth noting that we were wearing earplugs and earmuffs to protect our hearing whenever we turned these speakers to max volume. They're just that loud.

The control setup for the Z-560 set isn't perfect. With power, bass, treble, and a specialization control, as well as a headphone jack, the control panel has all the necessary accouterments. But the layout makes the very attractive Logitech control pod awkward to use. Nonetheless, the Logitech Z-560 is our new favorite 4.1 rig.

—WILL SMITH

MAXIMUMPC VERDICT

641
ALTEC LANSING

+ THE BEATLES

Great control layout and interesting subwoofer design come together to make decent sound.

- THE RUTLES

Unfortunately, the 641s just aren't the best speakers we've heard lately.

800.258.3288 www.alteclansing.com

\$280

8

MAXIMUMPC VERDICT

Z-560
LOGITECH

+ BARRY WHITE

They look good and sound great. These are the first speakers we've heard that give Klipsch a run for its money.

- BARRY MANILOW

The control pod for the Z-560 system could use some ergonomic improvement.

800.231.7717 www.logitech.com

\$200

10

Software Freak of the Month:

Typing of the Dead

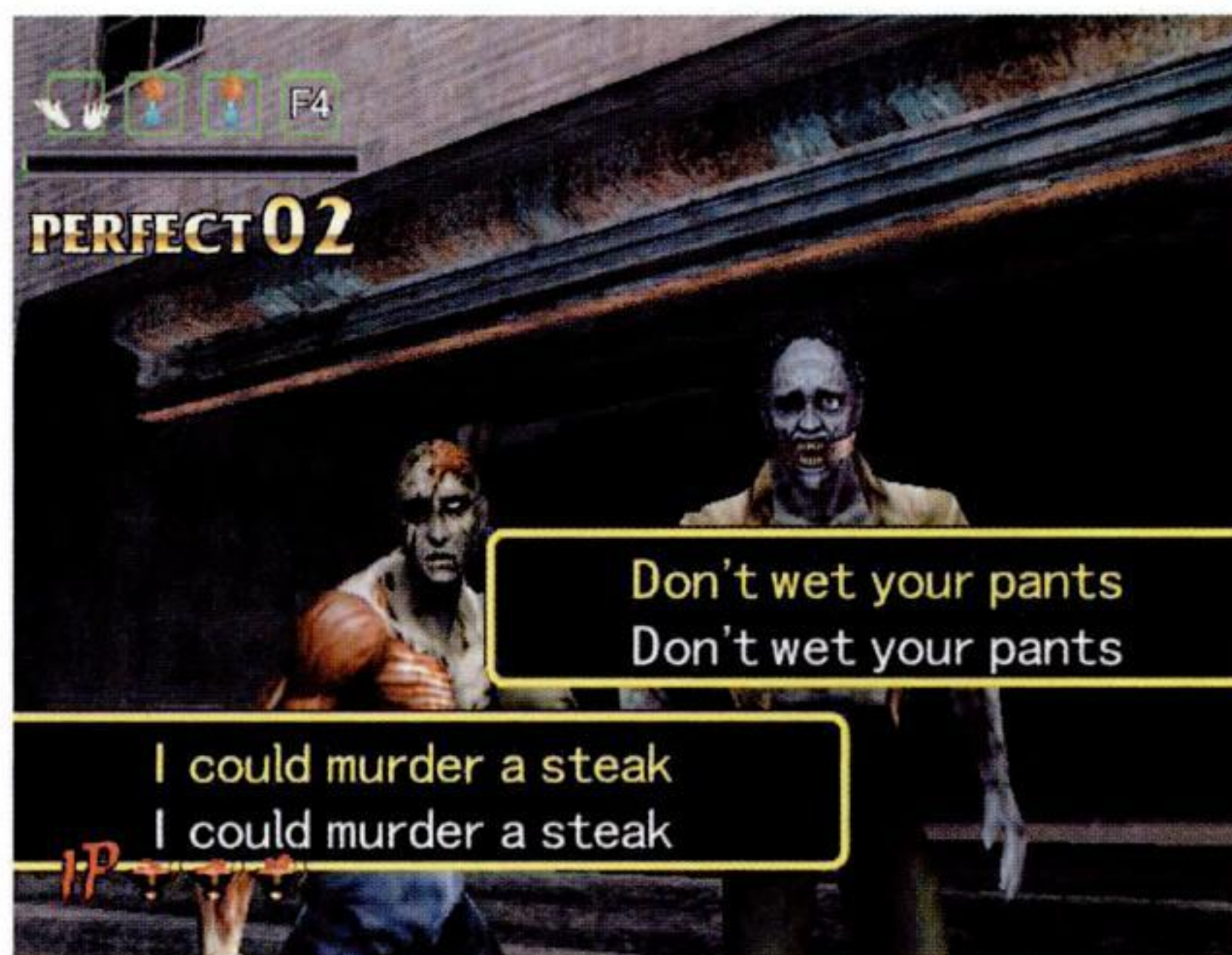
The keyboard is mightier than the sword!

Remember your first encounter with sushi? Staring at that cold, translucent slab of raw fish strapped to a ball of rice, you couldn't help but ask yourself: *Why?* Nonetheless, before you knew it, you were coming back for more. And so it goes with another kooky Japanese import, *Typing of the Dead*, a rail-shooter with a bizarre twist that's so addictive it ought to be considered a Class A narcotic.

Adapted from *House of the Dead 2*, Sega's coin-op classic, *Typing of the Dead* drops you into an elite cadre of conservatively dressed typists. Your goal is to eradicate an army of zombies, chainsaw-wielding maniacs, killer monkeys, and even the occasional invertebrate. But instead of wielding the sticky light-gun from the arcade game, the PC version turns your keyboard into a deadly weapon—the only way to dispense with the goons is by typing the letters, words, and phrases that pop up in front of them. Each correct keystroke excises a satisfying chunk from your target; each incorrect stroke brings the enemy closer to chewing off your face.

Game? Typing tutor? *Typing of the Dead* is actually both—so we'll just call it the quintessential software freak of nature.

The action begins at a reasonable clip, initially displaying single letters, numbers, and the occasional punctuation mark. After a while, however, it quickly ratchets up to words, word combinations, and sentences that grow longer as your typing spree progresses. Many of the phrases seem culled from a limitless database of smart-ass pop-culture spoofs, so beware: Pausing to snicker at "you've got whale" or "the sun shines out of our behinds" could cost you. And even if you've got the steely nerve to type quickly and accurately in the face of the undead, the bosses at the end of each level up the ante by imposing additional challenges. Some can be damaged only when words are typed without errors,



A couple of charmers from *Typing of the Dead*. You type the vowels, they lose their bowels.

while others ask questions that require you to type in correct answers.

Typing of the Dead keeps you on your toes (or is that fingers?) by throwing in timed missions and multiple paths through each level, and awarding power-ups and additional lives when you've spared cowering civilians from gruesome death. But the most amazing thing about this extra-freaky Freak of the Month is that the people at Sega didn't just swap out the controls to make the game playable without a light-gun. Oh no, they went the full Monty, as it were, beginning with an interactive typing tutorial that instructs you on touch-typing basics (including left- and right-hand exercises). Drill Mode even prepares you for fieldwork with sessions that test your speed, accuracy, reflexes, and prowess at typing special punctuation keys.

It's too bad *Typing of the Dead* is saddled with ugly-bugly 640x480 graphics. And while Empire Interactive did indeed add a cooperative multiplayer feature, it's extremely limited (LAN only), and not even officially supported. But when it comes to unbelievably frantic and addictive software freaking, *Typing of the Dead*—part typing tutorial, part *Resident Evil*, part Michael Jackson's *Thriller*—is one exotic taste that's definitely worth acquiring.

—LOGAN DECKER



Relax in between chapters with a few timed drill sessions in the *Typing of the Dead* tutorials.

MAXIMUMPC VERDICT

Typing of the Dead
EMPIRE INTERACTIVE

+ CHEERFUL

As unlikely as it sounds, typing really is more fun—and requires more skill—than using a light-gun.

- FEARFUL

It's still a console port, and the graphics didn't get a boost when the code jumped to PC.

415.439.4854 www.typeordie.com

\$20

8

Medal of Honor: Allied Assault

A captivating mix of realism, action, and Nazi-sniping fun

The year is 1944, and you're deep behind enemy lines in a bombed-out French town, 10 miles west of Brest. Your name is Lt. Mike Powell, you've just survived the invasion of Normandy, and now you must rendezvous with a U.S. Army tank crew—who are currently pinned down by enemy fire—and escort them to the far side of town. The only thing between you and success are a dozen battle-hardened German snipers equipped with superior weapons and dead aim.

Medal of Honor: Allied Assault takes a decidedly different approach to World War II than did *Return to Castle Wolfenstein*, which we reviewed last month. Instead of facing cartoonish, stereotyped Nazis in a litany of preposterous scenarios, *Allied Assault* is closer to being historically accurate, but does away with all the rigid realism that many people find tedious in hardcore tactical shooters, such as *Ghost Recon*.

The game is divided into six acts, each of which takes place in a different theater of the war. In-game cutscenes lead off most of the acts, providing wel-



Throughout the game, you'll find very creative scripted events. For example, when you break up their card game, the Nazis kick over the table, which you can then use for cover.

come continuity from mission to mission. Whether you've been tasked with the destruction of an enemy U-boat or the actual D-Day invasion of Omaha Beach (an absolute bitch of a mission that teaches you the meaning of the term "sitting duck"), each campaign is undeniably fun and dramatically different from the one before it. Even better, many missions include individual objectives that can be completed in whatever order you prefer—a nice break from the linear tedium of most other shooters. Even the dreaded stealth mission, where you must infiltrate an enemy base using a stolen uniform, is entertaining and doesn't necessarily require sneaking



All you need to do is run from here over to that other bunker. By the way, you might want to watch out for the two machine gun nests, the snipers in the bunkers, and the minefield.



around. Sprinkle in a few truly inspired missions in which you get to control vehicles—such as the jeep with a mounted .30-cal machine gun or the massive King Tiger tank—and you have a game you'll play well into the wee hours of the morning.

Mission goals are of the "find something and do something to it" variety, but they're nicely spiced and frequently involve explosives, which are hard not to love. Three massive cheers go to the spectacular compass feature that displays the distance to, and direction of, your next goal. This handy gadget will save you the frustration of searching empty building after empty building looking for a cleverly hidden goal, just like in every other first-person shooter that isn't totally linear, including *Half-Life*.

2015, the game's developer, revived the tried-and-true Quake III engine with some extra-special sauce, including location-based damage, volumetric fog, and variable-detail-level models and textures. The game's music is phenomenal, imparting a level of drama that all World War II sims should aspire to. In short, it made us shiver.

The one thing noticeably absent is the blood and gore typical of Quake III engine-based games. This was a conscious design decision handed down by EA, *Allied Assault*'s publisher. Apparently, EA feels it's OK to snipe someone in the head from 300 yards, but it's not OK for that head to bleed like a spigot. Regardless, you can rest assured that some inde-

pendent modder will distribute a blood patch just hours after the game's release.

Multiplayer? Outstanding. Eschewing the rigid "caste system" used by games like *Return to Castle Wolfenstein*, *Allied Assault* doesn't limit players to specific weapons. Instead, it allows you to choose one primary weapon to complement the standard pistol and grenade set—your options include a rifle, sniper rifle, submachine gun, heavy machine gun, bazooka, and the ever-popular shotgun.

The only real gripe we have with *Allied Assault* is that it lacks a unifying storyline that propels you from beginning to end. A richer narrative—or even just a few more recurring characters or extra dialogue among compatriots—would have given the game enough texture to push it into Perfect 10 territory. Still, *Medal of Honor: Allied Assault* proved to be the most entertaining 25 hours of gaming we've had in quite a while.

—WILL SMITH

MAXIMUM PC VERDICT

Medal of Honor: Allied Assault
ELECTRONIC ARTS

+ SCHNITZEL

Awesome gameplay, great graphics, player-controlled vehicles, and a World War II setting! What more could we ask for?

- SAUERBRATEN

Lacks purpose, blood, and gore.

<http://mohaa.ea.com>

\$40

9

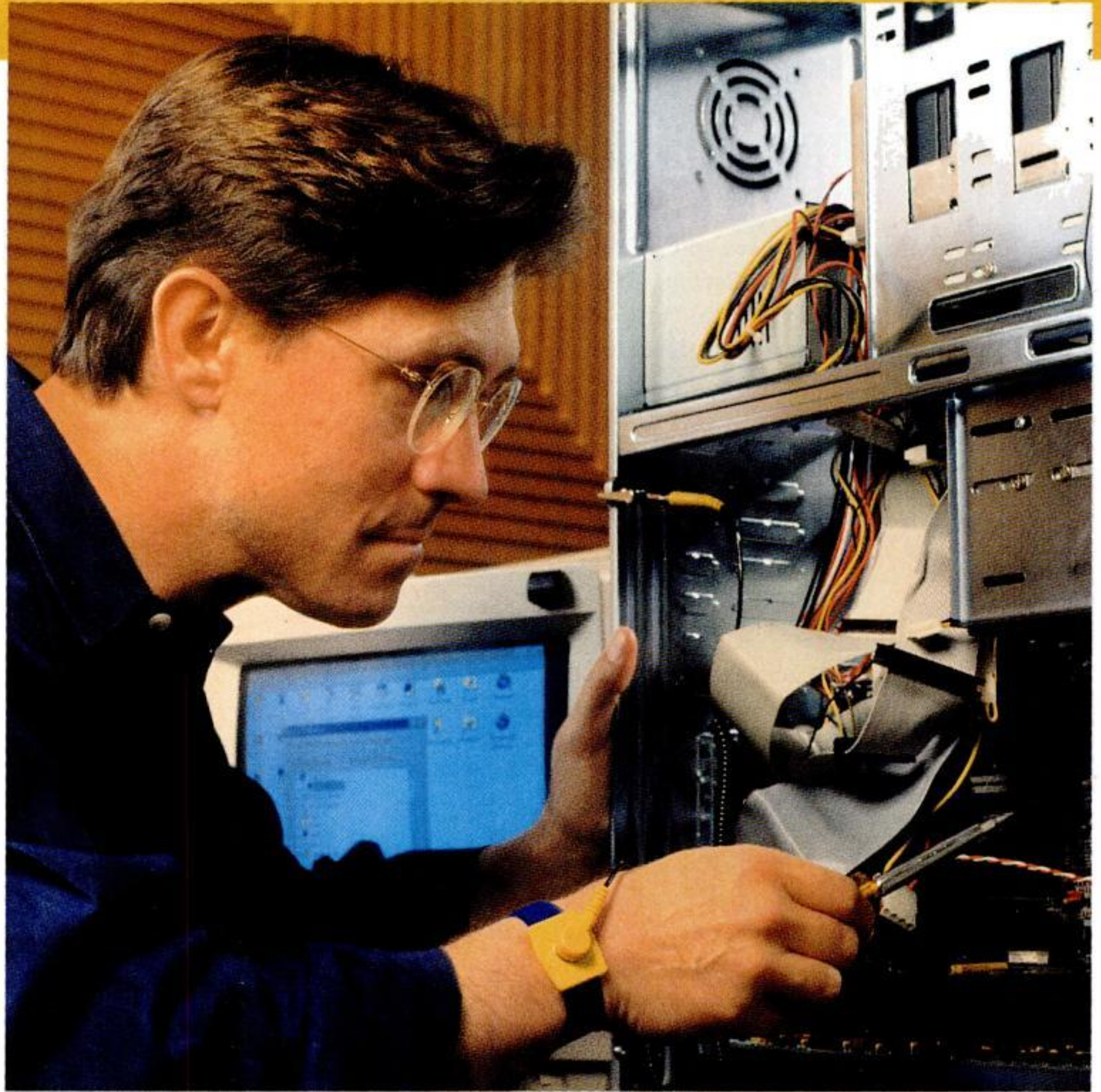
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Reader Reviews

Buy it, try it, and tell us what you think

This Month: Creative Labs Sound Blaster Audigy

In November 2001, we gave Creative Labs' Sound Blaster Audigy soundcard a Perfect 10 verdict. Senior Editor Gordon Mah Ung wrote, "the Audigy's high-definition audio makes a quantum leap forward in PC audio quality,"

and pretty much celebrated the Audigy as the best consumer-level soundcard ever created. But what do *you* think of Creative's finest? Four of our readers chime in with their reviews....

Singing Audigy's Praises

I'm a vocalist and spend hours recording with multitrack software such as *Cooledit Pro* and *Nuendo*. On *Maximum PC*'s recommendation, I ran out and bought myself an Audigy MP3+ card. 24-bit audio recording in a consumer-grade card? Yeehaw! I was very impressed with the ease of installation, but I was even more pleased with the sound quality—crystal clarity like nothing I had ever heard before from a PC.

After about a month, I had a nasty system crash (unrelated to the card), after which I was unable to reinstall the card. Apparently, it didn't want to play with my Creative Labs Modem Blaster. I was very unhappy with the tech support from Creative Labs—sitting on hold on my nickel is not something I relish. I was told to return the card at my expense, and to also send \$20 for service. Needless to say, I was not a happy camper. Fortunately, I was able to return the card in exchange for a Gamer model.

In my opinion, the audio applications included with the MP3+ version of the card are a lot of fluff. But who wouldn't want the free versions of *Deus Ex* and *Giants: Citizen Kabuto* that come with the Gamer version? I'm also tickled that the card comes with Asio drivers—a plus for musical types like myself. The audio quality is fantastic, and as with the Live! card before it, highly customizable effects are just icing on a very sweet cake. Now, if only Creative Labs would provide a toll-free number for customer support.

—KEVIN HOLMES

Less is Less, and More is Better

The front Live! Drive panel that installs into an open 5.25-inch bay has pretty much everything you could want. In my opinion, computers should come with more connections in the front—otherwise, I might end up using my computer backwards. The best part is the full-size headphone jack; when you have to lower the volume of your 5.1 speakers to keep somebody else happy, you can still keep the sound pumping through powerful headphones. An included remote allows you to control Creative's *PlayCenter*, but it's useful only if used in place of your standard music player, such as *Winamp*. I've noticed, however, that whenever I play music in something other than *PlayCenter*, there are lots of pops and cracks, which makes me wonder....

The Audigy has so much stuff on it, it's hard to fit everything into 300 words—but it's all that stuff that makes it worthwhile. My only complaint is that I've had to do a lot of tweaking to get everything to work fine.

—MARK A. SIMURDA

Light My FireWire

The sound quality is excellent, and the card's versatility is fantastic. It's got more I/Os than you can shake a stick at, and Dolby 5.1 and 24-bit audio are a must for any audiophile. The real kicker is the integrated FireWire connections. With the Platinum model, the Live! Drive IR is included, providing connections for headphones, mics, digital inputs and outputs, fiber and coax, plus MIDI and IEEE 1394. These are all great features, but the included remote is another story altogether. I got mine to work, but after I did, I wanted it to stop. Setting up the remote to find your music files requires you to use the mediocre software included in the package. The Creative *PlayCenter* managed

to slow down my system (an Athlon 1700+ with 512MB of DDR RAM) and consumes far too much desktop space.

If you're using either an old soundcard or, dare I say, onboard sound, then definitely pick up this card (skip the Live! Drive if you don't really need it—you'll save a couple bucks that way). But if you already have an SB Live! or another recent soundcard, there's no need to rush to the store to buy this card. My verdict? The card gets an 8, while the remote and useless bundled software get a 4.

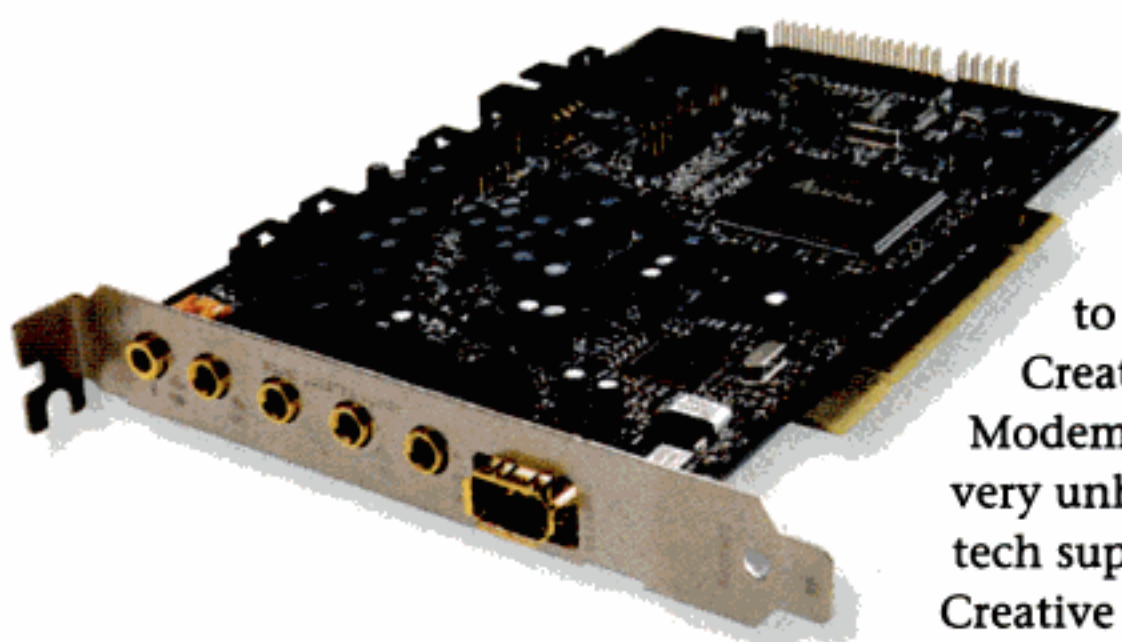
—DAN GIESBRECHT

Drivers—It's Always the Drivers

I own an Audigy Platinum Ex and, like many owners, have had serious problems. The Audigy isn't compatible with Windows XP running on newer Intel motherboards. My system is a Dell Dimension 4100 that includes a 933MHz Pentium III and an Intel 815e motherboard. Whenever I play MP3s, or any 5.1 sound source (including DVDs), the Audigy emits a high-pitched squeal and the system locks up. The only way to clear this lock-up is to hit the reset button. I have tried the card in my Dimension 4300 (Intel 845 motherboard) and the same thing happens. Dell owners seem to be most affected by this. The Creative newsgroup is full of complaints; the problem is known as "The Squeal of Death." The only fix to the problem is to revert to running WinME or 98SE. Creative has been less than responsive to the problem. The company refuses to release beta drivers and says it will release drivers only after they have been certified by Microsoft.

—SCOTT SLAVIN

NOTE: We at *Maximum PC* haven't yet tested the Audigy in a WinXP/Intel chipset environment, but we haven't experienced any problems running the card on a WinXP/Athlon machine. We'll do our best to cover Scott's problem in a future installment of *Ask the Doctor*.



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CPUs

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AMD DURON

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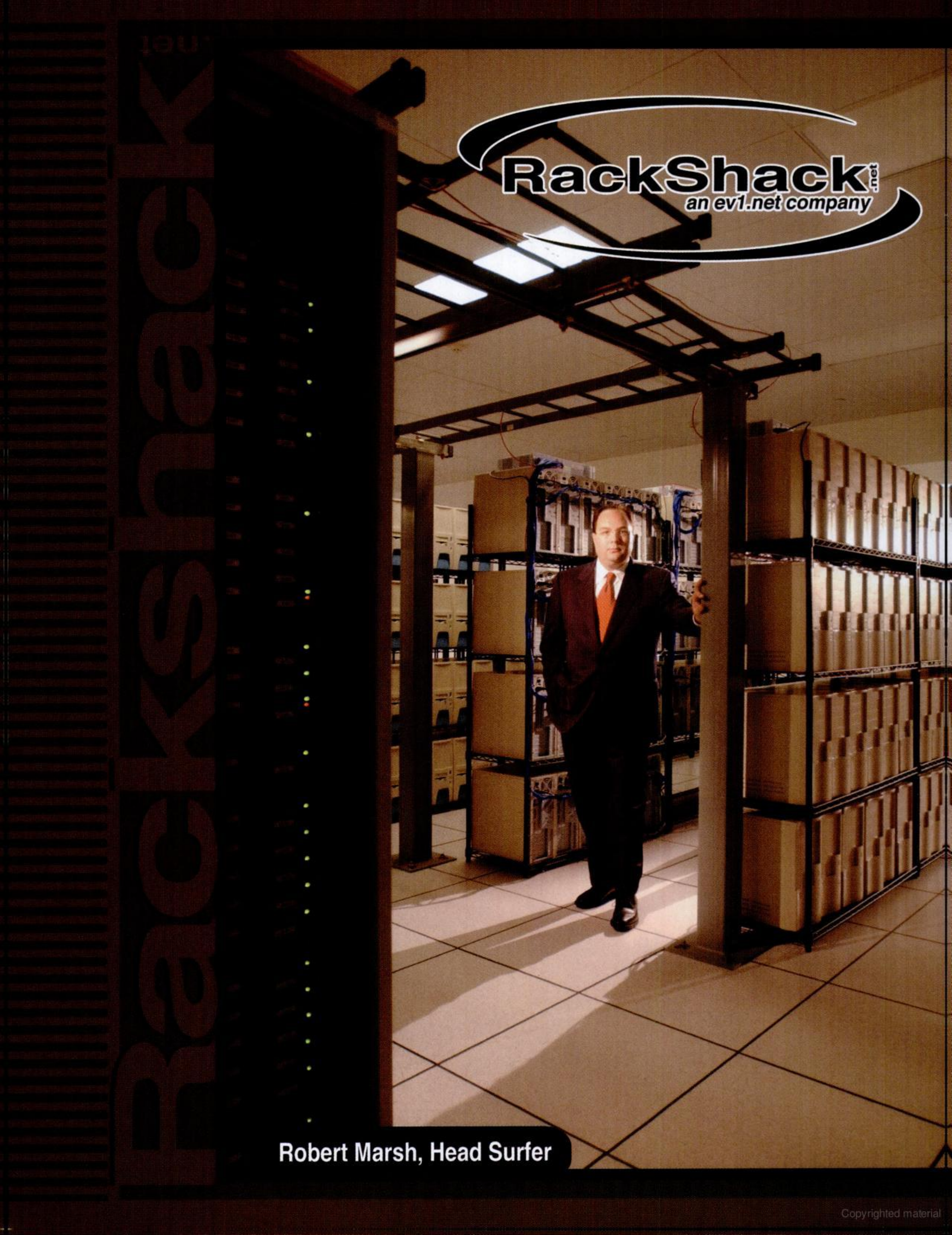
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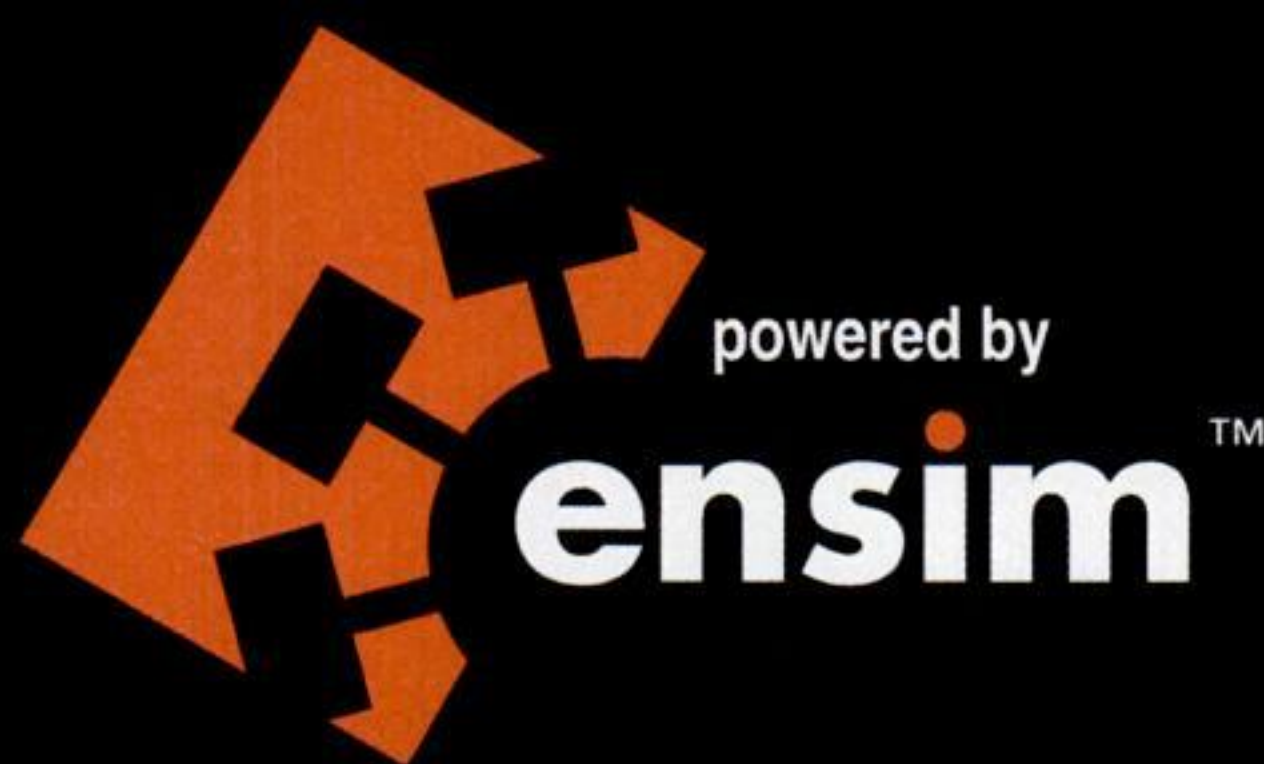
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CPUFX Complete Water Cooling Kit \$199

Fans & Grills

Fan Grills

Biohazard	80mm	\$18
	92mm	\$20
	120mm	\$24
Atomic	80mm	\$17
	92mm	\$19
	120mm	\$22
Swirl	80mm	\$19
	92mm	\$22
	120mm	\$25

Case Fans

Sunon	60mm	\$9
Sunon	80mm	\$13
Sunon	92mm	\$17
Sunon	120mm	\$21

CPU Fans

Thermaltake	DRAGON ORB 3	
AMD Athlon	1.5GHz+	\$29

Thermaltake
VOLCANO 7
INTEL Socket 370
& AMD Socket 462
\$19

Standard Grills

ThorTek	80mm	\$6
ThorTek	92mm	\$7
ThorTek	120mm	\$8

Thermaltake
VOLCANO P4
INTEL 478
2.0GHz +
\$19

Arctic Silver II
99.8% pure micronized
silver compound
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Thermaltake Active Memory
Cooling Kit Recommended for
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SDRAM PCB Dimension
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Thermaltake
Crystal Orb VGA
Card Chip Cooler
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Window Kits

Hydraulic Case w/Window & Neon



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Round	\$35
Oval	\$35
L-Shaped	\$40

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Hydraulic
Case with
Window
& Neon
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Window Etchings



Bio-Hazard Etched Applique	\$12
Atomic Etched Applique	\$8
Radio Active Etched Applique	\$8

Neons

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Blue, Green, Red, Black	
15" Neon Accent	\$35
Blue, Green, Red, Black	
15" Lava Neon Accent	\$45
Blue, Green	
6' Neon Glow Wire	\$39
White, Red	

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ATX PC Cases



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Fan 300watt
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Aluminum P4
300watt
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ThorTek
SuperMid P4
Black 320watt
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P4/AMD 300watt
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ATX Server Cases



Antec SX1240
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400watt
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Antec SX1040B
Performance
400watt
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Lian-Li PC70
Full Tower
P4 Ready
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ThorTek	5.25" Firewire CD Drive Case	\$159
ThorTek	5.25" Firewire Hard Drive Case	\$159
ThorTek	3.5" Firewire Hard Drive Case	\$95
ThorTek	3.5" USB 2.0 Hard Drive Case	\$89
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ThorTek	2.5" Firewire & USB Combo Case	\$109

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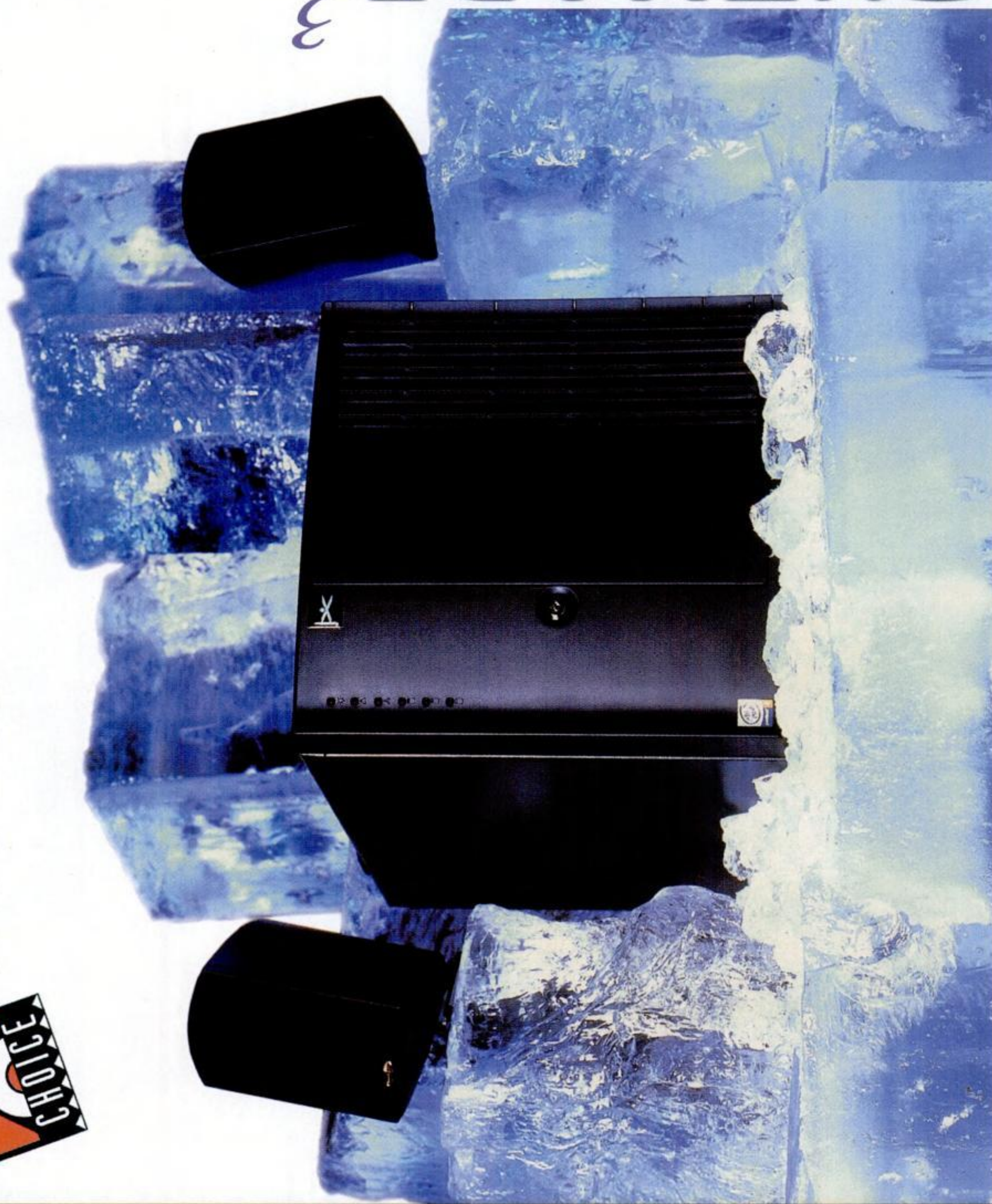
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-PC Gamer Magazine Feb '02



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- NVidia® GeForce3™ Ti-500 nFinite-FX™ GPU 64MB DDR Video Adapter
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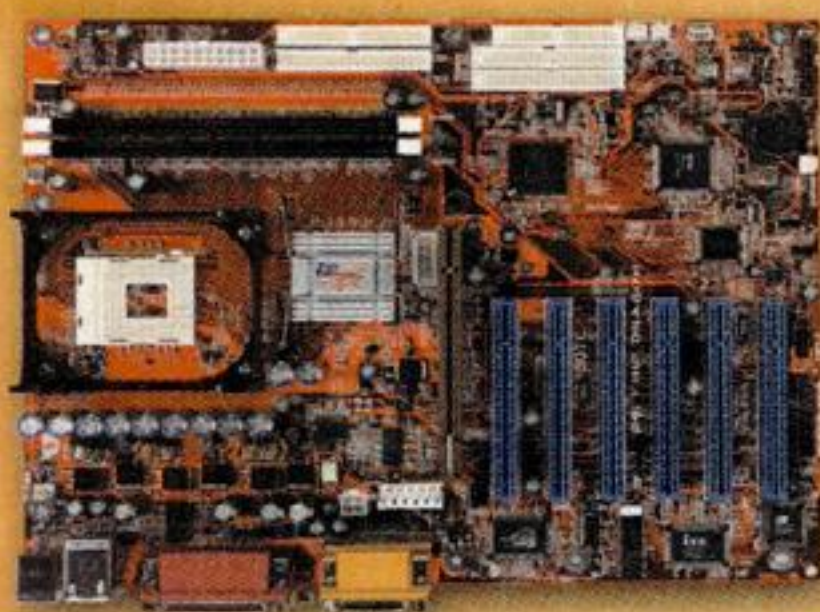
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^a AMD Athlon XP Processor 1700+ with QuantiSpeed™ architecture outperforms competitive 1.7GHz PC processors. QuantiSpeed™ architecture operates at 1.47GHz
AMD Athlon XP Processor 1800+ with QuantiSpeed™ architecture outperforms competitive 1.8GHz PC processors. QuantiSpeed™ architecture operates at 1.53GHz
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- Sun Micro StarOffice
- AMD Certified Power Supply

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XM2302



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XM3304



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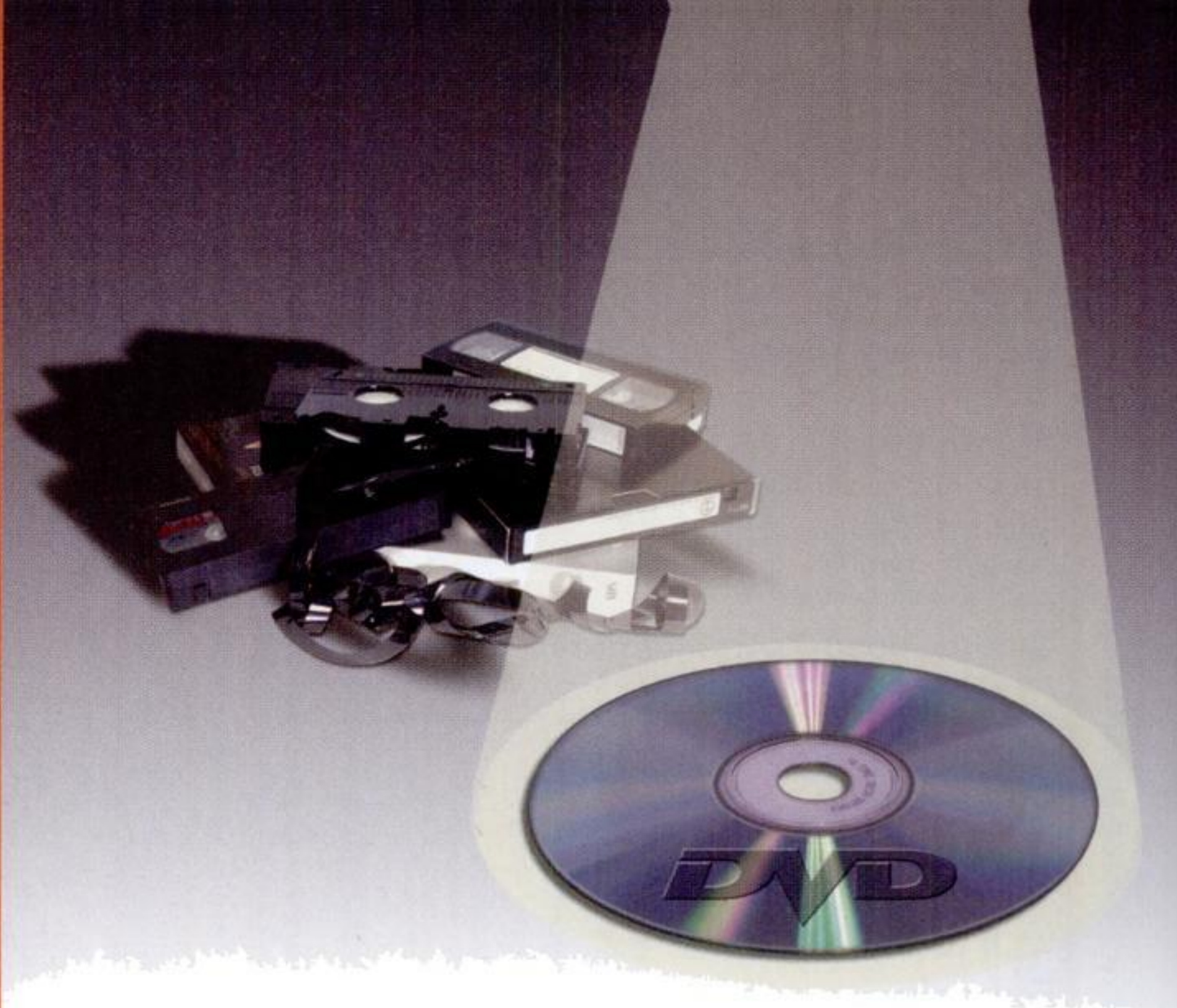
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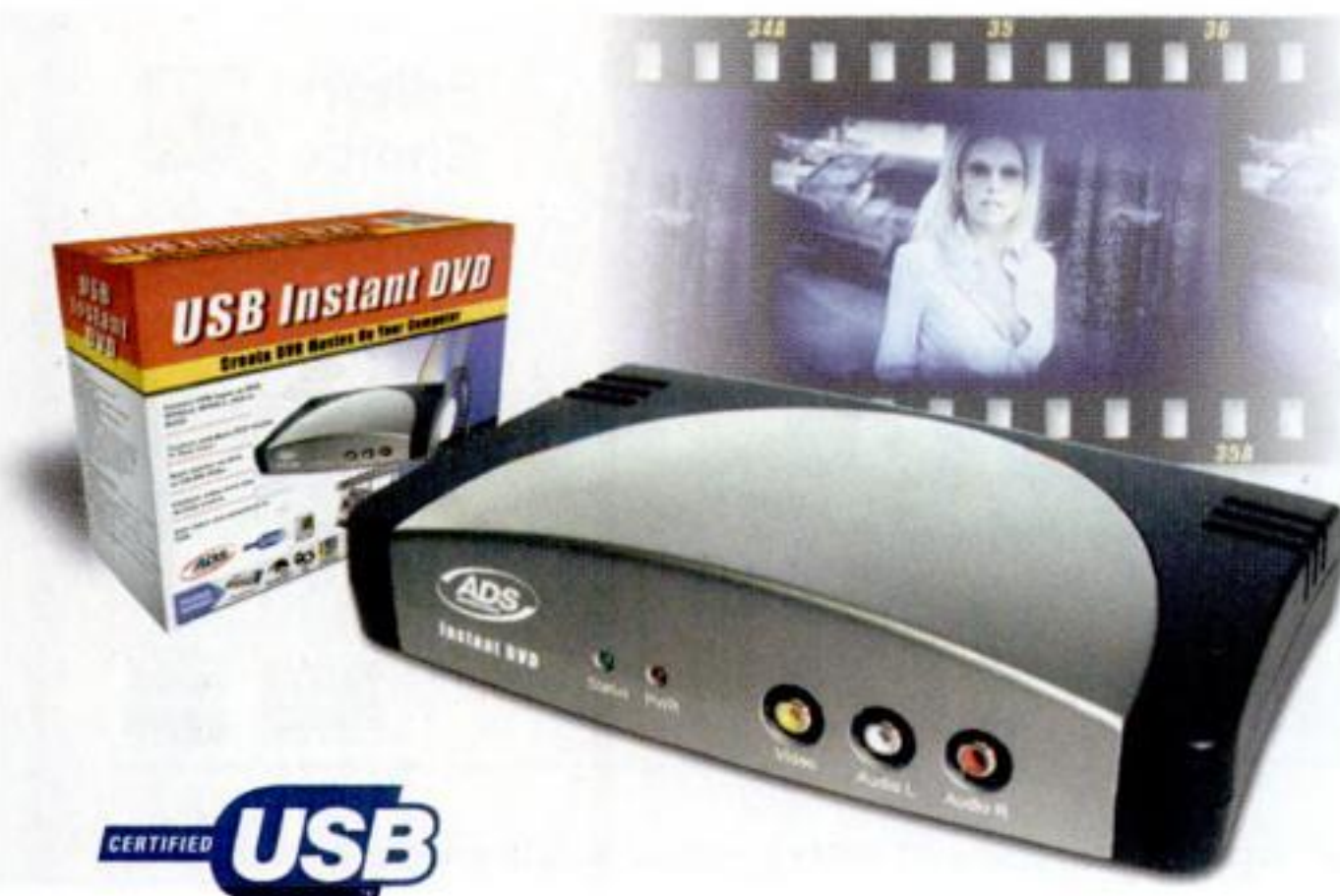
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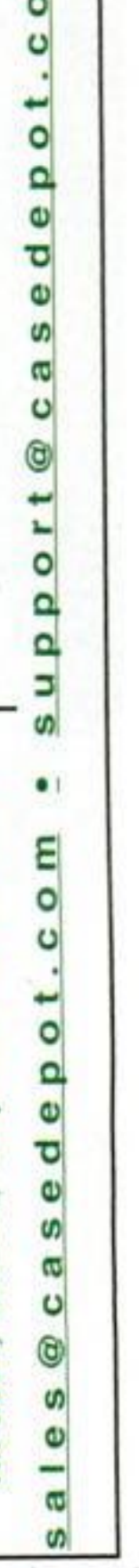
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R02/BARE	180/300	19x17.6x3.5	ATX	1/0	1/1	150W
R04/BW	275	19x24.3x3.5	ATX	1/0	1/3	250W
R05B	430	19x24.3x3.5	ATX	1/0	1/4	430W
R06B	250	19x20.2x5.25	ATX	4/0	1/5	300W
R08/BW	1550/1800	19x22x3.5	ATX	3/0	1/1	300W
R10/B	175	19x17x7	ATX	3/0	1/3	300W
R11/B	215	19x21x7	ATX	3/0	1/3	300W
R15/BW	295/510	19x24.4x7	ATX	6/0	2/2	300W
R17/B 4U	215	19x21x7	ATX	3/0	1/2	250W
R20/BW	275	19x20.5x7	ATX	8/0	3/0	300W
R22/BW	635/950	19x23.3x10.5	ATX	8/0	1/0	300W
R26/BW	630/850	19x22.6x10.7	ATX	4/0	2/4	300W
R28	290	19x17x8.7	ATX	8/0	8/0	300W
RSP	18	5.8x9.3x1.6	ATX	8/0	1	300W
RSM169-100	65/75	10x11.5x3	ATX	8/0	1	300W
001B1	75	10x11.5x3	ATX	1/0	1/1	90W
001B1	65	8.3x10.6x2.8	ATX	1/0	1/0	100W
002B1	88	6.9x14.6x5.8	ATX	2/0	2/0	60W
002B1	78	7.5x11.2x6.5	ATX	2/0	2/0	80W
004B1	105	6.8x15.3x9.3	ATX	4/0	4/0	230W
004B1	100	7.5x17.3x10.2	ATX	4/0	4/0	200W
007B1	180	7x15.8x13	ATX	7/0	7/0	250W
008B1	280	8.4x20.2x18.3	ATX	8/0	8/0	300W
008B1	180	7.5x17.9x17.1	ATX	8/0	8/0	250W
105LPX/TV	255/275	11x12.6x3	LPX	1/0	1/1	90W
109SP/90	175	11x12.6x3	NLX	1/0	1/1	135W
111N bare	260	11.6x10.6x2.5	MNLX	1/0	0/1	100W
192M ATX/B	85	13.1x16.5x3.5	MATX	1/0	1/1	150W
224	75	17.4x18.8x6.1	ATX	3/0	2/2	230W
257	70	16.8x16.8x6.2	ATX	2/0	2/1	250W
267	85	17.3x15.9x5.5	ATX	2/0	2/1	250W
271	75	16.9x17x6	ATX	3/0	2/1	230W
304	55	7.9x18.8x13.9	ATX	3/0	2/1	300W
325B	55	8.4x18.5x17	ATX	3/0	2/1	235W
327	72	7.5x16.5x17.3	ATX	3/0	2/2	230W
337	72	7.5x16.5x16.5	ATX	3/0	2/2	230W
338	55	7.7x14.7x13.6	ATX	2/0	2/1	145W
365	55	7.7x16.5x14.3	ATX	2/0	2/1	235W
367	55	7.7x16.5x17	ATX	2/0	2/1	235W
370	80	8.3x17.3x16.1	ATX	3/0	2/2	250W
382	80	7.5x17x17	ATX	3/0	2/2	250W
393	90	9x17.5x17.5	ATX	6/0	1/1	250W
396	55	8.3x17x15.5	ATX	3/0	1/3	230W
401	110	8.5x17.3x18	ATX	2/0	2/2	250W
405B	75	7.8x17.5x17.2	ATX	2/0	2/2	320W
408	80	8.2x19.8x18.4	ATX	3/0	1/5	250W
409	295	9.5x22x18.1	ATX	4/0	2/5	300W
411	67	7.2x17.2x16.8	ATX	4/0	2/1	250W
412	67	7.2x17.2x16.8	ATX	4/0	1/2	250W
413S/BL	75	8.8x19.5x19.7	ATX	8/0	1/0	300W
415	115	8.1x18.8x21.4	ATX	4/0	1/4	250W
418B/W	70	7.5x16.6x18.1	ATX	4/0	2/1	250W
422	70	7.5x18.9x16.7	ATX	3/0	2/2	250W
424	70	7.5x17.5x19.3	ATX	3/0	2/2	250W
426B/W/S	70/75	7.5x16.5x17.3	ATX	3/0	2/2	250/300W
436	70/85	8.6x18.1x15.6	ATX	3/0	2/2	250W
442	60	8.5x17.5x16.3	ATX	4/0	2/1	250W
445	110	8.5x17.5x18.6	ATX	4/0	2/3	300W
465	185	9.3x17x17.2	XEON/ATX	2/0	2/2	300W
467	75/90	7.5x16.7x18.8	ATX	3/0	1/4	250W
470	110	8.3x17.3x21.3	ATX	3/1	1/4	250W
471	110	8.4x17.5x21.3	ATX	4/0	2/2	250W
472	285	7.5x18x17.6	ATX	4/0	2/2	300W
474	70	7.8x17.2x17.2	ATX	4/0	2/2	300W
476	155	7.9x18.4x16.4	ATX	4/0	2/1	300W
478	155	7.9x18.4x16.4	ATX	4/0	2/1	300W
479	195	7.9x18.4x16.5	ATX	4/0	2/2	300W
480	80	7.8x19.8x17.5	ATX	4/0	2/1	250W
482B	67	9.6x19.5x17	ATX	4/0	2/1	235W
486	229	8.3x17.5x17.6	ATX	4/0	3/5	300W
489	234	8.25x17.8x16.5	ATX	4/0	3/5	300W
492	155	8.25x17.2x23.8	ATX	4/0	1/3	250W
496	501	14.8x20.4x18.4	ATX	8/0	2/4	300W
503R/B	295	14.8x20.4x18.4	ATX	8/0	2/4	300W
503B	295	14.8x20.4x18.4	ATX	8/0	2/4	300W
505	575	14.6x23x26.8	ATX	12/0	1/8	300W
505R	575	14.6x23x26.8	ATX	12/0	1/8	300W
506R	155/370	7.8x16.5x24.4	ATX	6/0	2/2	300W
518	145	8.1x18.5x26.5	ATX	6/0	2/2	300W
524	380	13.9x25.8x19.1	ATX	7/0	1/2	300W
526B/W	105/120	7.5x17.5x24.5	ATX	6/0	1/4	250W/300W
528	95/110	7.5x16.5x24.8	ATX	6/0	1/5	250W/300W
536	93/108	7.8x17x24	ATX	5/0	1/5	250W/300W
538	290	8x20.5x24.5	ATX	5/0	1/6	300W
560R	290/445	15x24.5x23.5	ATX	11/0	2/4	300W/300R
562R/BW	250/470	8.7x17.9x26.8	ATX	9/1	1/0	300W/300R
563R/BW	145/370	8.7x17.9x26.8	ATX	10/0	1/0	300W/300R
565	185	9.25x18.3x21.2	XEON/ATX	4/0	2/4	300W
568	95/110	7.5x17.2x22.8	ATX	5/0	2/4	300W
569B/W	210	13.5x17.8x14	ATX	6/2	0/8	300W/300W
570R	150/370	8.3x17.3x26.4	ATX	7/1	1/2	300W/300R
571R	160/370	8.3x17.3x26.4	ATX	6/1	1/2	300W/300R
582	105/120	7.8x16.5x23.2	ATX	6/0	2/1	250W/300W
588	99/114	7.8x16.5x23.3	ATX	5/0	1/3	250W/300W
1620R	950	16.5x20.3x34.3	F/ATXx2	16/0	300H	

R21 BW	275	19x18x7		8/0		300W
R22B/BW	635/950	19x23.3x10.5	ATX	8/0	1/0	300W/R
R26B/BW	630/850	19x22.6x10.7	ATX	4/0	2/4	300W/R
R28	290	19x17x8.7		8/0		300W
RSP	18	5.8x9.3x1.6			1	
RSM169-100	65/75	5.8x9.3x1.6			1	
001B	75	10x11.5x3		1/0		60W
001B1	65	8.3x10.6x2.8		1/0		50W
002B	88	6.9x14.6x5.8		2/0		60W
002B1	78	7.5x11.2x6.5		2/0		80W
004B	105	6.8x15.3x9.3		4/0		230W
004B1	100	7.5x17.3x10.2		4/0		200W
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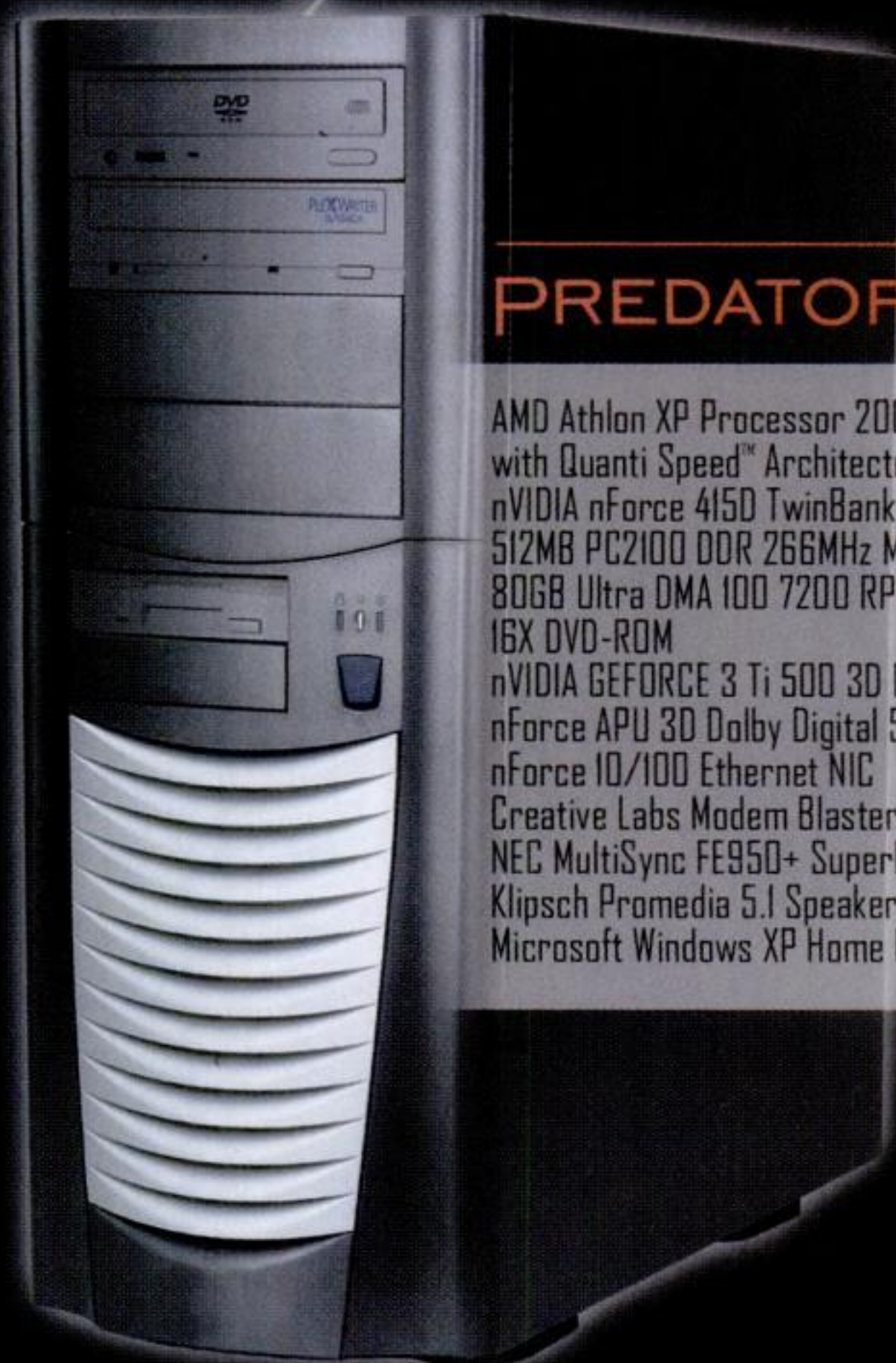


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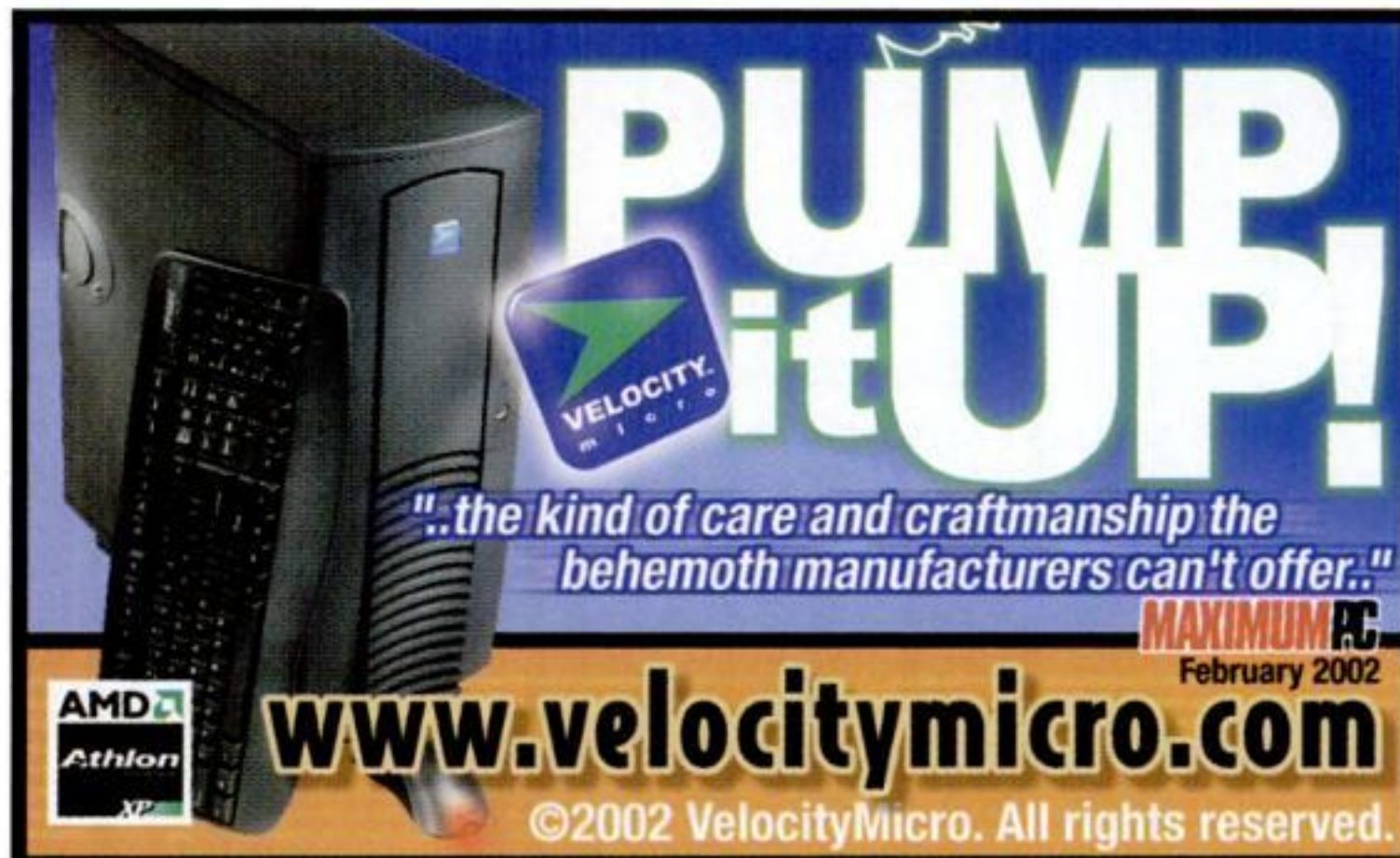
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Tyan S2390B, VIA kt133a chipset, SDram, 266bus, AGP4x, U100 \$104
Abit KG7 Raid, AMD 761 chipset, DDR, 266bus, Ultra 100 Raid, AGP4X \$163
Abit KT7ARA, via KT133a chipset, 266bus, SDram, Ultra 100 Raid, AGP4x \$123
DFI AM75-TC, via KM133a, SDram, 266bus, Ultra 100, AGP4x, audio, video \$88
FIC AD11-XP, AMD 761 chipset, DDR, 266bus, Ultra 100, AGP4x, audio \$104
FIC AN11, via KT266a chipset, DDR, 266bus, Ultra 100 Raid, AGP4x, audio \$117
Gigabyte 7VTXH, via KT266a chipset, DDR, 266bus, Lan, Ultra 100, audio \$125
Microstar K7N420 Pro, Nvidia Nforce chipset, 266bus, DDR, Geforce2 video \$171
Microstar K7T-266 Pro 2, via KT266a chipset, DDR, 266bus, Ultra 100, \$96

Pentium 4 Motherboards Socket 478

Abit BL7, intel 845 chipset, SDram, Ultra100 Raid, AGP4x, audio, Lan \$166
Abit BL7Raid, intel 845 chipset, SDram, Ultra 100 Raid, AGP4x, Lan \$166
Abit BD7 Raid, intel 845 chipset, DDR, Ultra 100 Raid, AGP4x, Lan \$
Intel D845WN, intel 845 chipset, Ultra 100 IDE, AGP4x, 3 sockets SDram \$130
Intel D845BGL, inte 845 chipset, DDR, Ultra 100 IDE, Lan, Audio, AGP4x \$130
Intel D850MVL, intel 850 chipset, RDRAM, Ultra 100 IDE, Lan, Audio, AGP4x \$171
Asus P4T-EA, intel 850 chipset, RDRAM memory, AGP4x, Ultra 100 IDE, audio, \$192
Asus P4B266, intel 845 chipset, DDR, Audio, USB 2.0, Ultra 100 IDE, AGP4x \$187
Soyo P4ISR, intel 845 chipset, SDram, Ultra 100 Raid, Audio, AGP4x, \$172

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SDram 168 pin Dimms by Micron

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512 megs	\$152	\$152

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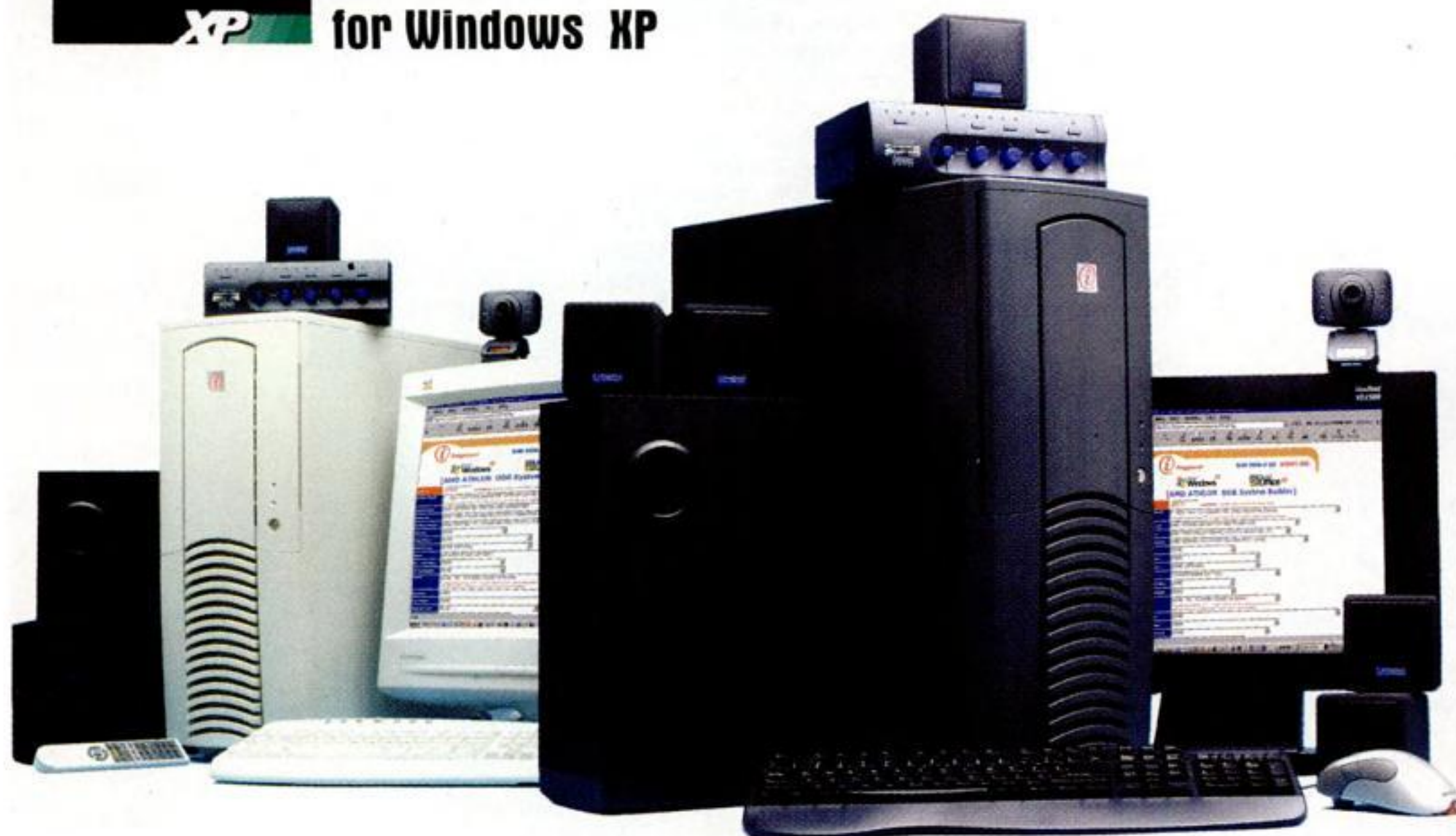
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1900+ with QuantiSpeed™ architecture	\$ 929	(abbsp034)	
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- MS Windows XP Home Edition CD
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- 19" Digital SVGA Monitor, .26mm
- PS2 Win98 Keyboard & Scrolling Internet Mouse
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1900+ with QuantiSpeed™ architecture	\$ 1139	(btsp034)	
2000+ with QuantiSpeed™ architecture	\$ 1189	(btsp035)	

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- upgrade: 19" ViewSonic GS790 .22mm @ \$179
- PS2 Win98 Keyboard & Scrolling Internet Mouse
- upgrade: MS Optical Intelli-Mouse @ \$27
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- PS/2 Mouse & Win98 Keyboard
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Intel® Pentium® 4	1.9 GHZ	\$ 1189	(chsp034)
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 - 56K V.90 Fax Modem w/Voice
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Intel® Pentium® 4	1.6 GHZ	\$ 1239	(pssp031)
Intel® Pentium® 4	1.7 GHZ	\$ 1269	(pssp032)
Intel® Pentium® 4	1.8 GHZ	\$ 1299	(pssp033)
Intel® Pentium® 4	1.9 GHZ	\$ 1349	(pssp034)
Intel® Pentium® 4	2.0 GHZ	\$ 1459	(pssp035)
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 - 24x10x40 CD-RW Drive
 - 64MB nVidia GeForce-3 Titanium 500 DDR Video
 - Sound Blaster Audigy 5.1 w/ IEEE Fire Wire upgrade: S.B. Audigy Platinum @ \$145
 - 56K V.90 Fax Modem w/Voice
 - 10/100 INTEL® Ethernet Network Onboard
 - 19" ViewSonic E90 SVGA Monitor, .23mm upgrade: 19" ViewSonic GS790 .22mm @ \$99
 - 7 Pieces 1000 Watt Surround Sound Speakers
 - PS/2 Mouse & Win98 Keyboard
 - MS Windows XP Home Edition CD
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 - One Year On-Site Warranty - add \$39

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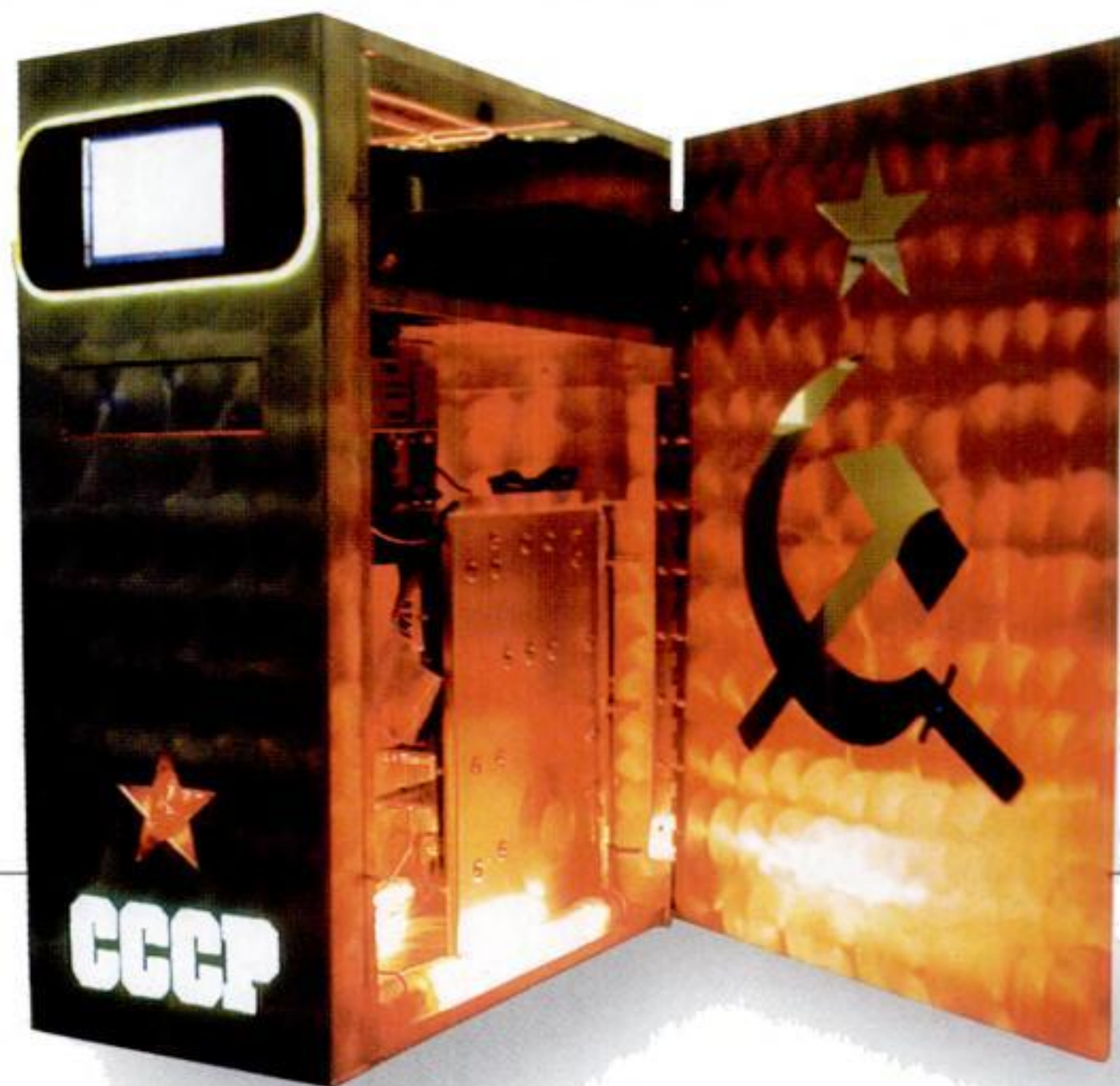
Rigs of the Month

THIS MONTH: CPL Case Mod Contest Winners

As promised in last month's Quick Start section, we present you with the winners of the "Consummate Case Contest" held last December at the Cyberathlete Professional League event in Dallas. If you're a case modder and want to get your box featured as a *Maximum PC* Rig of the Month, your ingenuity and creativity will have to equal what you see on this page. We thank Marc "Geezer" Weitz (the fourth place winner) and Gareth "Pheaton" Powell (www.pheaton.com) for submitting these pics and contributing information.

FIRST PLACE ► Anthony "Hamhouke" Stanley's Soviet Supreme

The body was handmade from aluminum, then dremeled, scrolled, and wire-brushed. The inside is rigged with a "pulsing laser show" synched to the hard drive's output, while the front panel features an electroluminescent-lined LCD that reports the PC's internal functions. The power button is lit with LEDs, which, when turned off, fade to a color that matches the case.



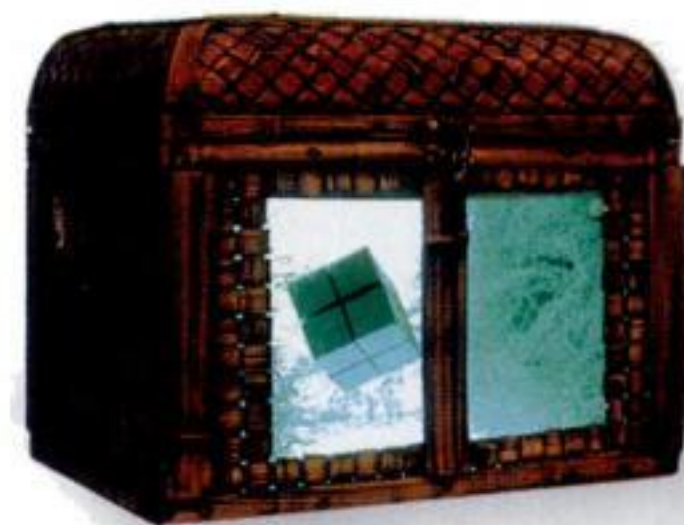
FOURTH PLACE ► Marc "Geezer" Weitz's X-Box

This rig's overclocked Athlon is watercooled with the help of a handmade acrylic reservoir. The case is made of hand-cut, florescent green and black Plexiglas, and fitted with four green and two black cold cathode lights. Electroluminescent wiring runs throughout. Bold and majestic, to say the least.



SECOND PLACE ► Dion "EnVaDoR" Liou's Wicked Wicker Basket Optical Illusion

Here's an ironic play on the old "look through my window and check out my hardware" gimmick. In EnVaDoR's own words: "I wanted to be different and have my Plexiglas window show something else. So, using a mirror positioned at an angle in the case, I made my treasure chest look like there was nothing but a cube floating in the middle. Where's the computer?! On the other side of the mirror, of course!" For details and interior shots, go to www.envador.com.



◀ FIFTH PLACE Troy "T-Bone" Erwin's Tubular

In T-Bone's own words: "The base for the case came from a cardboard telephone wire spool, and was sanded smooth, then spray-painted black. The Plexiglas was formed around the spool. It took me days to sand the cardboard down to the point that you couldn't see the lines in the paper wrappings."



◀ THIRD PLACE Barry "Cold Dog" Collins' Copper Top

This one is full of hidden details. The case body was stripped, then plated with copper. The 350-watt Enermax power supply was also copper-plated, while the internal chassis, drive cages, and fan grills were plated with yellow zinc. The handmade front bezel features an illuminated cigarette lighter (it's inside the yellow circle) as well as a voltage-regulator baybus equipped with a 12-volt bypass switch and LED display. Gold and black thumbscrews grace the PCI slots. And it's on wheels!

If you have a contender for Rig of the Month, e-mail input@maximumpc.com with pics and a brief write-up.

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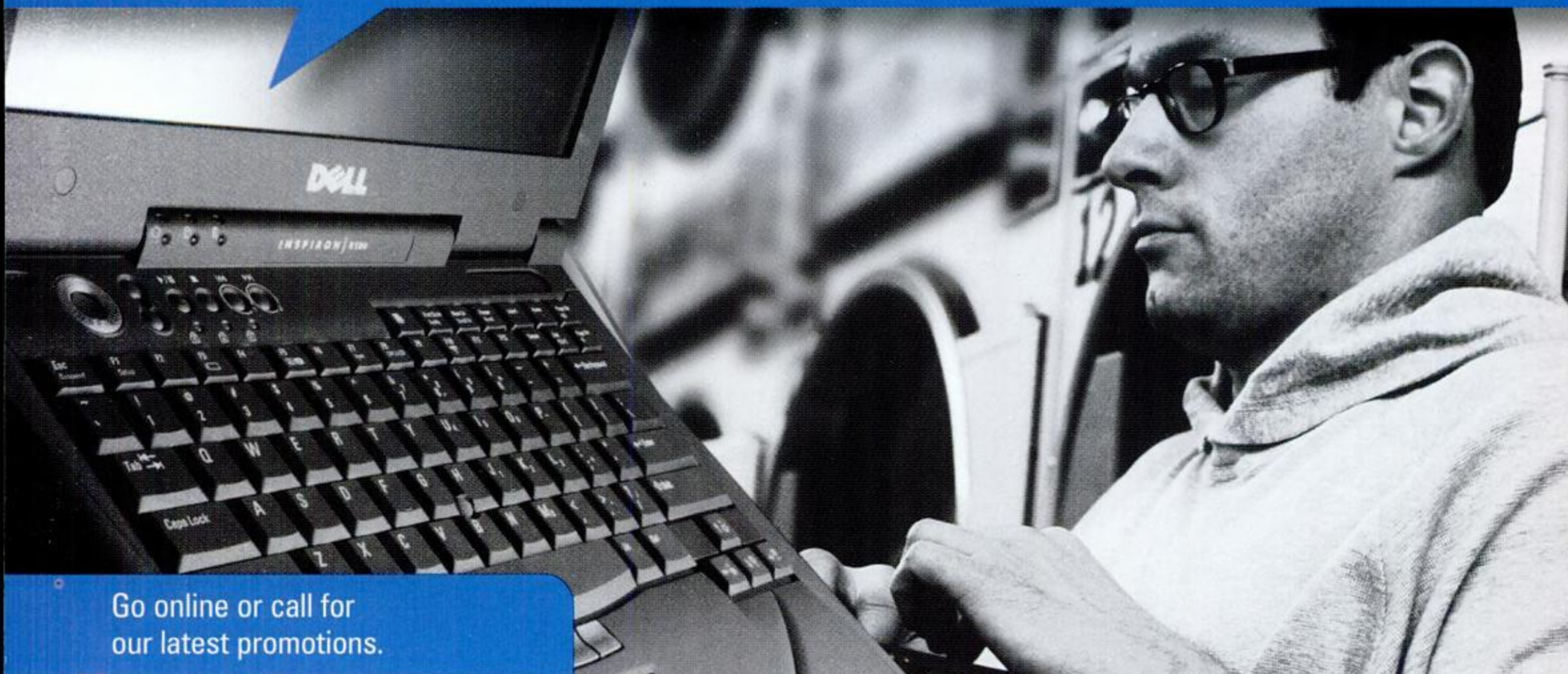
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